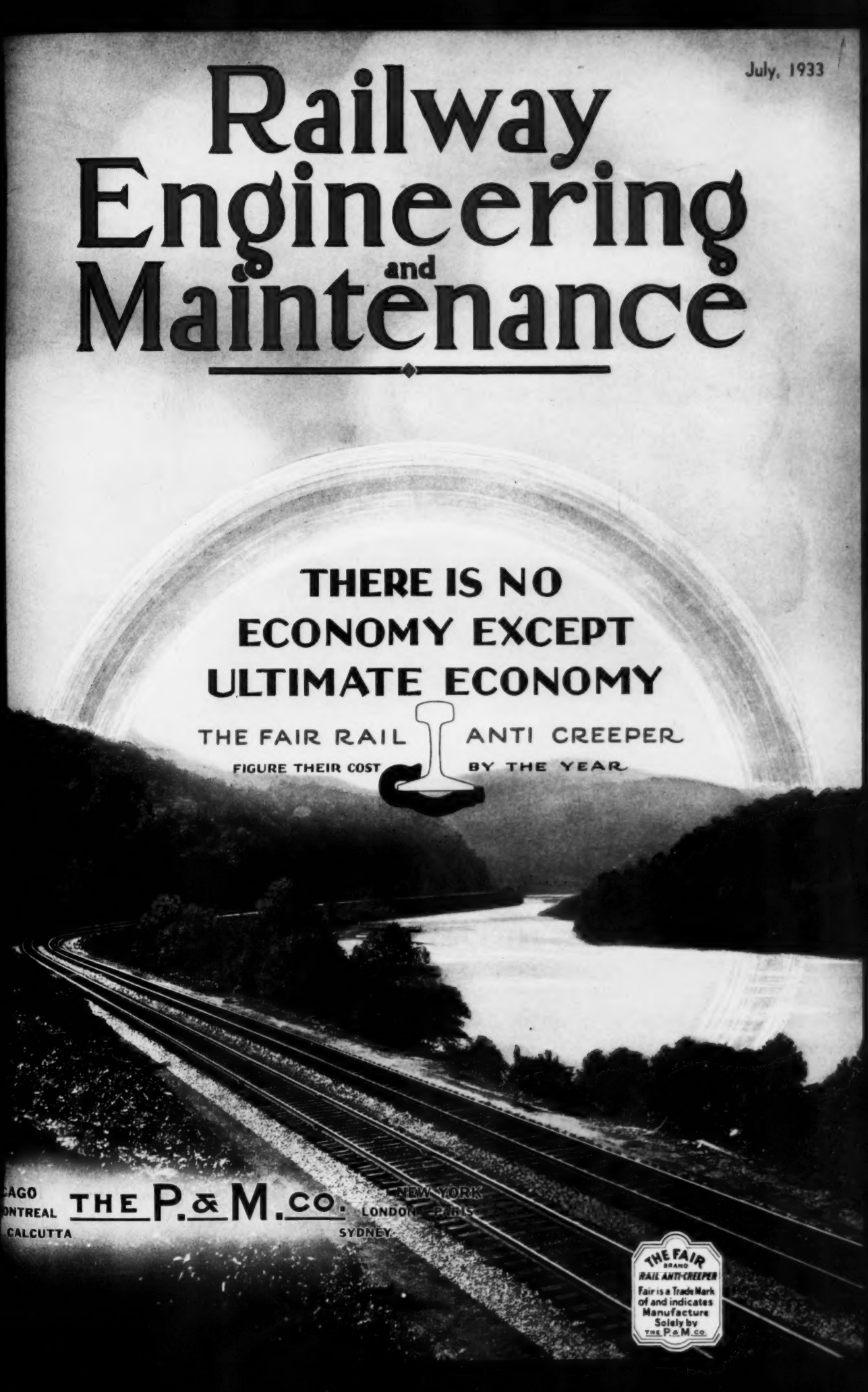
July, 1933

Railway Engineering and Maintenance



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Cut Devil Chisels
Hack Devil Adzes
Slug Devil Mauls
Slug Devil Sledges

Use Devil Tools

Working first with one steel—then with another . . . one heat treating process and then another, our engineers, determined to improve the quality of railway track tools, developed the Devil line . . . and *introduced alloy steels into maintenance service.* That was ten years ago. Today, hundreds of track gangs have found that these famous track chisels, spike mauls, adzes and sledges made from selected alloy steels, skillfully forged, then heat treated and hardened by our own proven processes, are safer . . . that they wear longer, do the work better . . . qualities that immediately recommend them to all railroad officials who are endeavoring to supply maximum transportation service at minimum maintenance cost.

WARREN TOOL CORPORATION

Successors of The Warren Tool & Forge Co.

General Offices • **WARREN, OHIO**

CUT DEVIL CHISELS • HACK DEVIL ADZES • SLUG DEVIL SLEDGES • SLUG DEVIL MAULS

No. 55 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: OBSOLESCENCE-MINDED

June 29, 1933

Dear Reader:

"There is a wide-spread feeling among those who sell to the railroads that they are not obsolescence-minded - The railroads cannot afford an organization of specialists whose business it is to keep abreast of all of the technological advances in equipment and processes, such as water service, etc.—In fact, no industry is harder to do business with than the railroads."

So read a letter which I received a few days ago from an officer of one of the country's largest manufacturing concerns, a concern whose business with the railways runs into millions of dollars annually. Is this indictment of the railroads and especially of their water service departments correct? I had my own opinion but I decided to investigate. The result appears in part in this issue. A more complete report will appear in August.

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But I decided to look further. I found that on another road which had 264 water stations in 1921, improvements in operating practices have since made it possible to abandon 56 of these stations, while the power units at 65 water stations and the pumping units at 34 points have been replaced with more modern equipment in the last 12 years. On still another road, I found that the pumping equipment had been modernized at 47 stations and the power units at 43 stations during the last few years.

Approached from another angle, I found that on a fourth road, one of the country's largest and most efficient, the cost of operating and maintaining water stations had been reduced approximately 50 per cent per locomotive-mile in the last three years, notwithstanding the great decline in traffic in this period. Incidentally, each of these roads concentrates responsibility for the operation of its water stations on a superintendent of water service, who specializes in this one phase of railway operation and is constantly studying developments in water service practice to determine wherein he can improve the operation of his facilities.

Do these facts support the indictment cited above? I cannot believe that they do. Rather, I feel that railway water service will compare well with similar activities elsewhere. I also feel that what is true of water service is true in similar measure of other branches of railway service and that so far as funds have been available, railway officers are as keenly alert to the economy of modern equipment as any other group of men. Does your experience confirm this observation?

Yours truly,

Elmer T. Howson

ETH:EW

Editor.

MEMBER: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

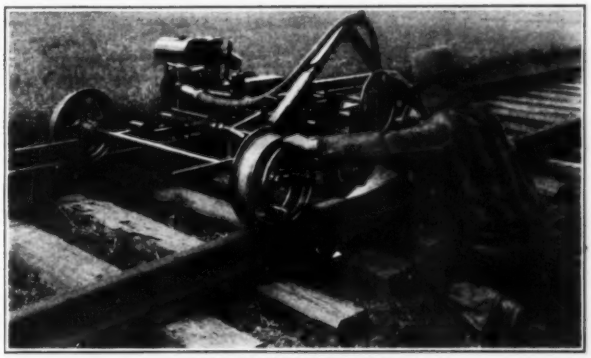
The better way to maintain JOINTS

CROSS GRINDER

With these tools, joints can be kept tight, smooth riding and future expense for maintenance greatly reduced

Above

A light weight, simple grinder that will slot from 60 to 80 joints per hour. Also suitable for switch maintenance.



RAIL GRINDER

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For grinding rail ends after welding, this machine is fast, simple to operate and will do an unusually smooth job of grinding.

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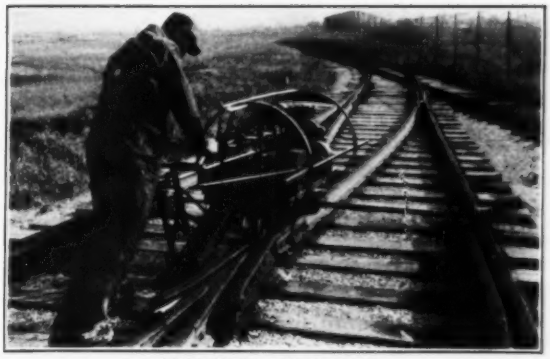
The Power Wrench is applicable for rail relaying, changing angle bars and joint maintenance. With its one operator, two four-bolt joints can easily be tightened in less than a minute. It can reach most nuts at switches, frogs, etc., and each bolt will be uniformly tightened. There are two speeds, reversible in either direction.



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Railway Equipment Department

NORDBERG MFG. CO.

MILWAUKEE, WIS.

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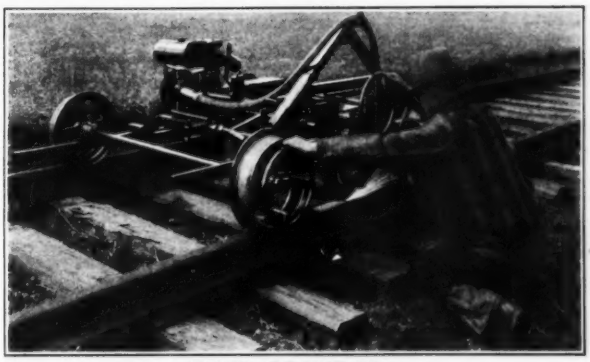

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JULY, 1933

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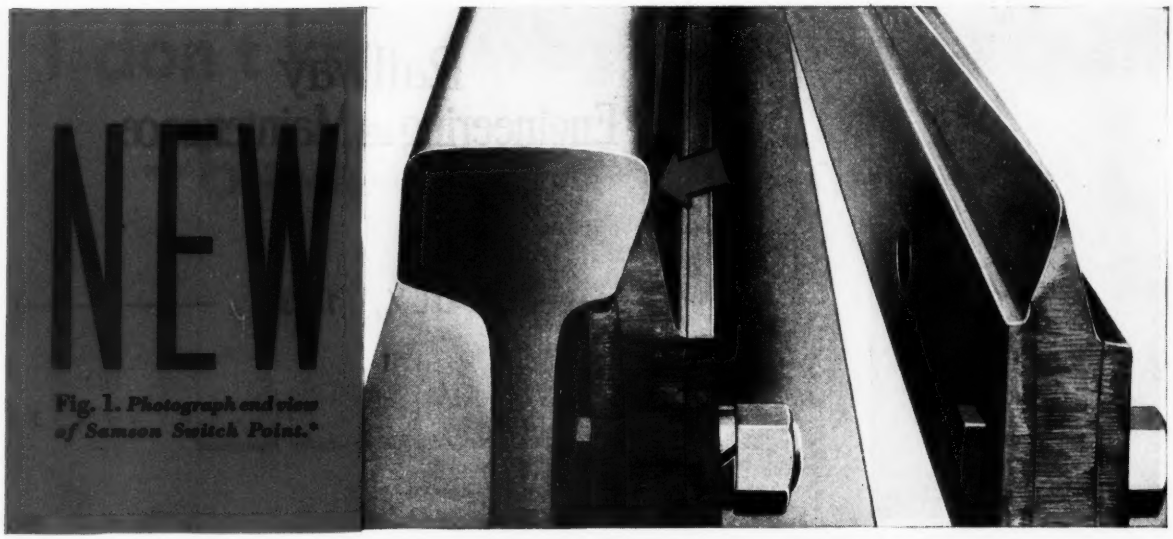

Fig. 1. *Photograph and view of Samson Switch Point.**

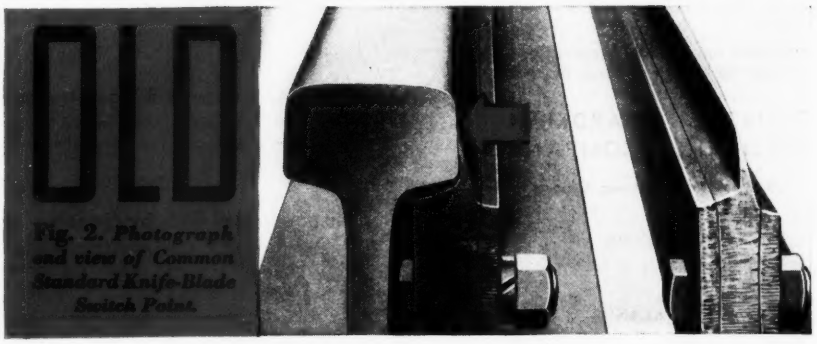

Fig. 2. *Photograph and view of Common Standard Knife-Blade Switch Point.*

THE RACOR SAMSON SWITCH POINTS*

with no extra cost . . .
assure remarkable economy and added safety

WHEN considering switch points take into account that the Racor Samson Switch* means no more short life of switch points . . . no more broken down switch points . . . no more need of switch point protectors.

Samson Switch Points maintain necessary wearing surfaces to engage wheel flanges for a smooth safe passage; with them there is no danger of wheel flanges mounting on jagged wearing surfaces; they give many times the life of common standard knife-blade switches. There is probably no recent innovation in trackwork that will give a greater return on investment than the Racor Samson Switch.*

Its remarkable length of life is assured by the inverted 'V' shape of the point that fits against the undercut stock rail as shown in Fig. 1 . . . It wears smoothly and WILL NOT BREAK DOWN.

Switch points, plates and rods cost no more than old standard equipment. The cost of the stock rails, machined as illustrated in Fig. 1, is negligible when compared to increased service life. Machined stock rails can be purchased with the switch; or, if preferred, they can be satisfactorily milled in the field with a portable milling machine, operated either electrically or pneumatically from air brake pressure cylinder.

Many large railroad systems in Continental Europe have adopted universally similar switch point planing. Also many large systems in the U.S.A. have installed the Samson Switch with proof of the above claims.

For further information write your nearest Ramapo plant or office.

*While covered by United States patents, all the larger manufacturers specializing in trackwork in this country have licenses to furnish the Samson Switch.

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[illegible]

Railway Engineering and Maintenance

A NEW DEAL

Railways Are Sharing in Vast Changes

WE ARE hearing much of a new deal. It is pervading every channel of industry. Governmental control of agricultural prices and forced reductions in acreage tilled; governmental refinancing of mortgages; governmental control of industry, including the fixing of hours of labor and of wages and the possible licensing of the right to do business—on every hand dictatorial power never before granted any one man or group of men in peace times.

Nor is the railway industry immune. Equally vast changes are taking place here. One innovation is following another with such rapidity as to leave a railroader of the old school in a daze. A federal co-ordinator, 110-mile-per-hour passenger trains, stream-lined to new designs, competition on every side, freight schedules equalling and even exceeding those of passenger trains, store-door collection and delivery of freight. These and many other innovations testify to a new day in steam railway transportation—a day that is of vital concern to every employee of a railway because of the very direct effect that it will exert on the nature and permanency of his own employment.

A Co-ordinator

Probably the most outstanding of these changes is the appointment by President Roosevelt on June 16 of a "co-ordinator" for the railways, a position created in the transportation legislation enacted at his request early in June. The functions of the federal co-ordinator of transportation, as he is to be termed, is to assist (or force) the railways to effect such economies as may be possible through the elimination of competitive wastes, etc., and to release them from many legal restrictions to which they have heretofore been subjected and which tend to promote expensive competition. This co-ordinator, who is to be assisted by committees of five representatives from eastern, southern and western roads, respectively, is given wide authority over their management, with appeal from his decisions only to the Interstate Commerce Commission. This position carries with it dictatorial power over the railways and over anti-trust and other legislation affecting them that is more far reaching than ever before given to any one man in peace times. The legislation is classed as "emergency" in character and is limited to one year's duration, with the possibilty of extension by presidential proclamation for a second year. Joseph B. Eastman, a member of the Interstate Commerce Commission, has been appointed co-ordinator and has already entered upon his duties.

110-Mile-Per-Hour Train

Another startling innovation of the past month was the announcement by the Union Pacific that it had awarded contracts for the construction of a three-car articulated train of radically new design that will operate at 110 miles per hour. This train will be stream-lined to reduce air resistance and will be of aluminum construction, weighing not more than 160,000 lb. It will be powered by a 600-hp., distillate-burning internal-combustion engine. Shortly following the announcement of this train, the Chicago, Burlington & Quincy announced the award of a contract for a similar train of stainless steel construction, and it is reported that other roads are considering similar innovations.

Still another evidence of the new era among the railways is the tendency to substitute co-ordinated for competitive service between key centers, brought about by economic and other pressure for the elimination of waste. Out of this came the elimination early in April of one passenger train in each direction daily by each of three roads operating between Chicago and St. Louis. A short time later, the Chicago & North Western and the Soo Line reached an agreement regarding the co-ordination of certain of their services between Chicago and St. Paul-Duluth. Numerous other measures of similar character are now under consideration, all tending to reverse recent practices and to reduce competitive service to the needs of traffic.

No Longer Monopolistic

Of outstanding importance is the gradual recognition by railway men that railway service is no longer monopolistic in character but is facing competition on all sides—from the bus and truck, the waterway and the airplane, and that if the railways are to survive, they must meet this competition with service equally as attractive to the patron. No longer do progressive railway men ignore these newer agencies of transportation, but they are becoming more and more alert to detect those phases of the service offered by competing agencies that are attractive to patrons and are endeavoring to equal or excel them. This attitude of aggressive action is rapidly superseding the complacent attitude of past years and is leading to many departures.

One of these changes is the speeding up of freight

service. This trend, while prevalent for several years, has been especially pronounced during the last two or three years until today freight trains are running 50 to 60 miles per hour. As a result, over-night service is afforded many points up to 300 miles apart, while the schedules between more remote points has been reduced by days. Neither is this service limited to a few "red ball" trains but it is characteristic of freight traffic as a whole, drag freight trains having become practically extinct.

Another evidence of a recognition on the part of the railways of the necessity for meeting competition is the rapid spread in storedoor pick-up and delivery of freight. The practice of requiring a shipper to call at the freight house for l.c.l. freight and to deliver it there has been so long established as to appear inherent in railway service. The motor truck has changed this situation. To meet the flexibility of the truck, roads in the Southwest, in the South, in New England and elsewhere are now calling for and delivering freight, with certain limitations. The day does not appear to be far removed when the railways will universally render a complete transportation service from the door of the shipper to the door of the consignee for package freight and possibly for carload commodities.

Another result of truck competition, to which the railways are awakening, is the demand by shippers for smaller shipping units. Jobbers who formerly purchased in 40,000-lb. lots are now finding it possible to buy in 5,000-lb. or 10,000-lb. lots. This is creating a demand for lower minimum carload requirements. It is also giving rise to the use of smaller and lighter cars, such as, for illustration, a four-wheel refrigerator car of 20,000 lb. capacity which has recently been built for one of the packing companies.

These innovations are typical of others which might be cited, each of which is exerting a marked influence on railway transportation. They afford indications of the direction in which railway operation of the future is headed. That railway employees, and no less the employees of the engineering and maintenance of way department, must prepare to meet these changes should be self-evident. Tracks and structures must be so constructed as to meet the speeds of the future—terminal facilities must be revised to meet new standards of service—above all, there must be a consciousness that we are entering an era in which old methods no longer suffice.

START NOW

Better Earnings Should Mean Better Upkeep

BUSINESS is getting better. Evidence of this is to be had in various commonly accepted indices; for example, the increase in the rate of production of the steel industry from 24 per cent of capacity early this year to 50 per cent at the present time. But in no measure of business activity is this shown more definitely than in railway carloadings. Thus, for the week ending March 11, carloadings were 137,668 *less* than for the same week of last year, while for the week ending with June 17, they were 69,533 *more* than for the same week last year. Also, during the six consecutive weeks ending with June 17, 243,101 *more* cars were loaded than in the same weeks of last year, and preliminary figures available from some of the larger roads give every indication of still further increases in the movement of freight.

The improvement is reflected also in railway earnings for May, which are definitely better than for May, 1932, a number of railways having turned operating deficits into net operating incomes. The returns from 52 railways for May show a combined net operating income of $32,000,000, compared with $12,445,000 for May, 1932, or an increase of 157 per cent. The first 30 roads to report showed larger gross revenues in May than in the preceding year, whereas only four had shown an improvement in April. And since the traffic in June was appreciably greater than in May, it is certain that the earnings in June will be much better than in May.

While this improvement in business has been going on for 3½ months, with every evidence of its continuation throughout the rest of the year, it behooves every maintenance officer to bear in mind that half of his active year has passed, and that if any portion of the increase in revenues is to be applied to sorely needed repairs to tracks and structures, steps must be taken at once to secure appropriations for such work. That there is much that must be done needs no demonstration here. As one officer of track has well said, the present riding quality of track belies the actual deterioration that has taken place. But if any of this depreciation is to be made good this year, it must be done before the working season is over. Act before it is too late.

RAIL JOINTS

Good Maintenance Pays a Large Profit

IT HAS been a relatively short time, well within the memory of many maintenance officers who are still active, since no amount of effort or attention would assure a satisfactory condition at the rail point. At present, however, as a result of the efforts of railway engineers and manufacturers, the design of and materials in modern rail-joint fastenings have been so improved that the performance of this important element of the track has been greatly improved, and joint maintenance has ceased to be the problem that it once was.

This does not mean that modern rail joints have reached perfection; on the contrary, it is recognized that they have not. What it does mean is that with proper attention to maintenance, the life of the joint and of the rail can be extended far beyond the limit which was possible in the past, or that can be attained now if the maintenance is poor or even indifferent. When one feature of maintenance is neglected it is to be expected that others will be. If this is so, any ill effects that may result from improper joint maintenance may be accentuated, and the life of the rail still further shortened.

In the past, except on curves and in a few special locations, rail has been renewed on main tracks, not because it was worn out, but because of battered ends and worn fishing surfaces. Recently, welding has been applied to recondition battered rail ends and the life of the

rail thus extended. While it is a matter of record that by this means rail that is properly cared for otherwise can be retained in service for periods up to several times its previous normal life, neither the welding process nor its application to track work has as yet been developed to the point where the ends can be rebuilt an indefinite number of times, or until the remainder of the rail is worn to the extent that it must be removed.

It is not debatable that the rate of rail batter and the wear on the fishing surfaces are influenced very directly by the character of the maintenance that is given the joints, being most rapid where maintenance is most neglected. This indicates the importance of giving such attention to the maintaining of the joints as will insure a minimum rate of batter. As a further indication of the importance that many railway officers attach to a high standard of joint maintenance, an officer of long experience said a few days ago that his road estimated that it could afford to spend $1 on a joint if by doing so the life of its heaviest section of rail would be extended only 1.6 months. On this basis, any expenditure up to $2,000 a mile can be justified if the life of the rail is thereby extended for another year. This is a startling statement which becomes more startling when it is realized that only a few roads spend in excess of this amount annually for all items of track maintenance.

While the figures given applied only to a heavy rail section and will not hold true for lighter sections, it is only the amount which can be justified that will differ, since the principle upon which the statement was based remains the same. In other words, if this officer's estimate is correct, and with the proviso that the work is of such a character as to prolong the life of the rail and it is admitted that good maintenance will do this, there would seem to be no limit, within the practicable range of the operations of the average section gang, to the amount of attention that can be given with profit to the maintenance of rail joints.

BETTER EQUIPMENT

Water Supply Plants Are Being Improved

FEW elements of the railway plant have been subjected to more marked improvement than the water station, and in this particular field the change in the power units for the operation of pumps is worthy of special note, for it comprises a story of the gradual supplanting of one type of power by another, only to be followed by the introduction of still other means of pump propulsion. Each change has resulted in greater economy of operation but has brought with it the need for greater technical knowledge on the part of those who were responsible for the adequacy and reliability of water supply.

Until the turn of the century the steam pump reigned supreme. Its operation required little technical skill and it was reliable because it would continue to work even in a dilapidated condition. However, it had the disadvantage of low efficiency, much lower in fact than the best of steam plants, because the limited size of the majority of these plants did not warrant the installation of other than the most primitive type of equipment—in most cases, a low pressure locomotive-type boiler and the common duplex reciprocating pump. The fact that it required constant attendance and was wholely unsuited to intermittent service added still further to the incentive for its replacement by some other type of power.

It was natural, therefore, that the introduction of the gasoline engine should lead to the substitution of this new power unit for steam operation in railway pumping plants. It occupied less space, required attendance only for starting and stopping, and the elimination of a cumbersome fuel delivery operation made it possible for the first time to locate the pumping plant away from tracks. True, the pumpers found the gas engine "tricky," they were not always easy to start, but improvements in design, especially of the carburetors, and increased skill on the part of the pump attendants soon overcame the difficulty.

The gasoline engine enjoyed wide-spread use until the introduction of the oil-burning engines, with their lower operating costs, imposed a competition which it could not meet. In the meantime, also, the growing network of central station electrical transmission lines made electric power available, and where favorable rates were offered, the electric motor offered real competition for the best of the internal combustion engines. However, the use of electricity presented a serious obstacle in that it involved the employment of electricians or the training of the existing maintenance staff in the technic of electrical equipment, and thus served to retard the introduction of electrically-operated units. Later this obstacle was offset by the perfection of the remote and automatic control of pumping plants operated by electric motors, and as water supply departments were reorganized to maintain electrical equipment, its use involved no difficulties at all.

Realization of the economies that have been and are being effected by the installation of modern pumping equipment has tended to give water supply operations an increasingly important status in railway service. It has demonstrated to railway managements that water supply is sufficiently important from the standpoint of dollars to be saved or dollars to be wasted to warrant real study and adequate supervision. In part, this is the price paid for the greater operating economies obtained, but this greater cost for the supervision of more economical and more complex equipment will have as a by-product the development of projects for even further economies, for in most cases increased supervision has taken the form of a separate organization skilled in water supply problems and alert to discover new measures for improvements in results.

SOUTHERN PACIFIC GETS LOAN.—The Reconstruction Finance Corporation has authorized a work loan of $1,000,000 to the Southern Pacific, Texas and Louisiana lines, to be used in the construction of a new passenger station and terminal facilities at Houston, Tex. This project has been under consideration for some time, but had been postponed because of difficulties in financing. It is estimated that this project will furnish 501,312 man-hours of employment for more than 20 crafts, in addition to employment in the industries for the necessary building materials and equipment for which orders will be placed.

Preparing a Crosstie Program*

An account of the practices followed on the Milwaukee in selecting, treating and distributing ties so that they will be inserted under the conditions to which they will be best adapted

By D. C. CURTIS

Chief Purchasing Officer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

A Typical Stretch of Track on the Milwaukee in its Electrified Mountain Territory

SINCE crossties constitute the largest single item in maintenance costs, they should be considered as of first importance in any study of the economics of track maintenance. The economics of ties is, in itself, a subject of such magnitude, however, as to warrant special study. The economical selection, treatment and use of ties requires (1) a complete survey of the nearest timber that is available for ties at a reasonable price; (2) that orders be drawn on the producer by grades and species and that, in loading cars, the grades and species be segregated; (3) a chart of the railroad on which to designate the most desirable wood and treatment for each section of track; (4) that the treating-plant piles be segregated as to grades and species, to insure separate treatment for each species; (5) a selection of the treatments that give the best results with the wood to be treated and the place at which it is to be used; and (6) that the using department order the kind of tie wanted, for the place wanted, and in addition, that the shipping department has a copy of the chart to insure that ties of appropriate grades, species and treatment will be distributed to their proper places.

Survey of the Timber Important

A survey of the timber available for ties can be obtained from the statistics of purchases, if they have been kept by species and grades. If such records have not been kept, they should be started and the timber available for tie supply should be cruised by competent cruisers. Such a survey of the timber adjacent to our lines has resulted in our adopting the preferential ranking for the lines east of Mobridge shown in the table in the next column.

For the lines west of Mobridge, the following rank is given: (1) Douglas fir; (2) Inland Empire larch; (3) Inland Empire fir; (4) coast Douglas fir. No treatment is applied, except to the Douglas fir in rank (1), which is treated with a mixture of creosote and petroleum.

Selection of the different species for our eastern lines is based on the cost of the wood, the length of haul and the quantity and quality available. The Pacific Northwest and the territory west of the Cascade Mountains produce two species which are used almost to the exclusion of other woods for crossties; namely, Douglas fir and West Coast hemlock. West Coast fir, when treated to a retention of 8 lb. with a 45-55 or a 50-50 mixture of creosote and fuel oil, is demonstrating a satisfactory life, particularly on tangents. Hemlock ties from this territory are giving a good record with similar treatment. The hemlock takes treatment as satisfactorily as the fir, but does not respond to artificial seasoning as well. This is because of the excessive sap content, which, in the green wood, ranges from 35 to 78 per cent.

Lines East of Mobridge

Rank	Kind of wood	Treatment for Grades 1 and 2	Treatment for Grades 3, 4 and 5
1	Red oak White oak	Zinc chloride	Creosote-petroleum
2	Gum	Zinc chloride	Creosote-petroleum
3	Black walnut Cherry Hard maple Yellow birch	Zinc chloride	Creosote-petroleum
4	Northern pine Live tamarack	Zinc chloride	Zinc chloride
5	Southern pine	Zinc chloride	Zinc chloride
6	Cedar	None	None

Quality Depends on Amount of Summerwood

In what is known as the Inland Empire, comprising the eastern part of Washington, the panhandle of Idaho and Western Montana, red fir, larch and pine crossties are produced, with the preponderance of fir and larch, since the pine is softer and more costly. Inland Empire fir and larch are much more refractory woods than Douglas fir. The percentage of summerwood, together with the number of annual rings over the top quarter section of the tie should be stressed in the purchase of West Coast softwood ties. Most railways require a minimum of ⅓ summerwood and 6 or more rings of annual growth to the inch, and 50 per cent of summerwood in fewer rings, which seems to make a good specification. Numerous rings to the inch do not insure a good tie, however, unless the summerwood is also present. A Douglas fir tie with 20 rings to the inch, but with less than ⅓ summerwood is not as good as one with only five

*Abstracted from a paper presented at the twenty-ninth annual convention of the American Wood Preservers' Association at Chicago.

rings and 50 per cent summerwood. For this reason, a specification written on annual rings only, without taking summerwood into account, does not insure a tie that will be the most economical in the long run. Inland Empire fir and larch are naturally close grained and exceedingly dense, for which reason it is not necessary to reject ties made from these species because of insufficient summerwood.

Comparative uniformity in the grades of ties supplied is secured by specifying the percentages of the various grades desired, rather than by accepting woods run as is shown by the following record of deliveries over a period of 14 years.

Year	Percent Rejects	Percent Culls	Percent Grade 1	Percent Grade 2	Percent Grade 3	Percent Grade 4	Percent Grade 5
1925	14.20	7.60	15.20	13.30	47.70	0.80	1.20
1926	9.90	3.00	12.80	12.40	58.70	1.10	2.10
1927	6.08	1.93	12.80	15.02	52.23	6.74	5.20
1928	6.81	2.00	14.27	14.03	49.03	10.14	3.72
1929	7.36	0.43	14.50	15.49	47.98	9.80	4.44
1930	6.17	0.46	15.10	14.68	43.42	13.64	6.53
1931	5.83	0.05	12.62	14.63	41.84	19.74	5.29
1932	3.00	.....	7.00	15.00	40.00	30.00	5.00
1933	.....	.....	10.00	15.00	40.00	30.00	5.00

Drawing Orders on the Producer

Drawing orders on the producer should state in specific terms exactly what is wanted, including the kinds of wood, the grades and the quantities of each grade that will be accepted. They should also specify that the ties must be manufactured properly, that species and grades must be separated and that as fast as the ties are produced they must be piled properly for seasoning, either at the point of production, the loading platform or wherever else the producer may have them in his possession.

The producer will resist when he is first asked to separate his ties as to species and grades, but by a little planning there need be no extra expense, he will have fewer rejects and he will, therefore, obtain a larger return for his timber. It is not difficult for the mills so to arrange their chutes or runways as to accomplish this result. The small producer can just as readily drop a tie where it belongs as to mix the ties indiscriminately. Where there is not enough of any one kind for a carload, different species or different grades of the same species can be loaded in different parts of the car and the waybill and shipping notice be so marked. The timber buyer and his inspectors should give considerable time to educate producers to produce ties as wanted.

In the early days, in certain sections on our lines, the farmers took up timber tracts for their wood supply, but with the advent of the railroads and coal, they were never used. At present, these tracts have a large percentage of ripe timber and since a farmer usually does not know how to make ties, a demand has arisen for tie producers with portable saws which they can move from tract to tract, just as threshing machines go from farm to farm. As a result of educating these producers, we are receiving excellent ties of accurate dimensions and uniform grade, and properly loaded. They have learned to place a divider here and a few rollers there, to arrange their piling strips properly, to manufacture a good tie and to season it properly to prevent checking, stain, etc. These better methods have reduced degrades to a minimum and lowered handling costs, while they give the maximum return for the timber handled. Properly educated producers are the keystone of the whole system of tie selection and use.

Our practice in charting tie distribution started from an investigation which was made to discover the major reasons for tie renewals. We had assumed that the causes for removal were the normal effects of decay, rail-cutting, broken ties, etc., but we soon discovered that a tie which was removed because it was rail-cut was not the logical tie to use in that place. In other words, a hardwood tie should have been substituted for a softwood, where the service was such that the treatment life of the softwood could not be obtained because of mechanical failure. Again, where a zinc-treated tie was removed because of decay, as a result of the treatment leaching out under water or extreme dampness, an oil-treated tie probably would have attained full mechanical life. We also found that under certain traffic, larger ties could be substituted to advantage for smaller ones. Again, we found that where softwood ties were being supplied to class "B" divisions that showed the heaviest renewals on curves, the rate of renewal was reduced by placing hardwood ties on curves and using the softwoods on tangents. A proper distribution to realize the fullest economy often requires the shipment of 12 or more kinds of ties to one division.

For the purpose of getting the right tie in the right place, a study of the line should be made by motor car by operatives who are duly informed as to the kinds, species and treatment of the ties with which the railroad is stocked or intends purchasing. The chart should be marked to show the billing station nearest to the consuming section. This study requires the complete co-operation of division engineers, roadmasters and, above all, the section foremen. It is the latter who have to be shown most definitely that the railroad will benefit greatly if they will place ties by species and grades where it has been predetermined that greater life can be expected, even though the ties they must use are heavier, spike harder and are larger, thus necessitating the removal of additional ballast prior to tie placement, and resulting in their daily records of work performed reflecting less actual placements per man-hour.

The knowledge obtained from charting the railroad must be disseminated and everyone kept informed as to the kind of ties that are to be provided and where they are to be placed. This requires frequent contact with the persons interested and frequent inspections to see that instructions are carried out.

Pile Separately at the Treating Plant

Too often in the past, a tie has lost its identity as soon as it was delivered to the treating-plant yard for either treatment or seasoning. The only way that one can select ties suitable for treating 5 to 12 months prior to their actual use is to see that they are piled separately by species and grades in the treating plant and that proper records are kept. They are then available for framing, treating, marking for the place where they are to be used, and shipment when wanted. By proper co-operation with the treating plants, this can readily be worked out, and, as in all systematic studies and handlings, it can be done with maximum economy.

In wet territory, only oil-treated ties should be used. Where tracks run parallel to rivers or through swamps, a zinc-treated tie rarely gives a life exceeding 11 years, whereas oil-treated ties will give a life of 20 years in the same territory. It is economical to use oil-treated ties on even class "B" or minor divisions where they are continuously in damp soil that causes the zinc salt to leach from the wood. There may be opposition to the use of oil-treated ties on minor divisions, but if the life is doubled, it certainly is economy to use the oil treatment.

In the selection and treatment of timber, a large part of the development work has heretofore been done by the railroad, but this is also a problem for the producer. He should study his woods, he should know the treat-

ment that is best adapted for them, and the best methods for treatment. Different species of wood require different seasoning methods as well as different treating methods. Hemlock requires an entirely different method of handling in treatment than maple, birch or beech. Oaks require different handling than any of the other woods, and this is also true of gum.

Economic Life Is Important Item

The economical life that can be expected of a wood is an important item in the selection of the treatment. By artificially seasoning certain of our woods we are able not only to make a saving in carrying charges, but we also obtain less checking and better penetration and distribution of the preservative. By artificial seasoning, the cellular structure does not have time to take a permanent set so that the channels through which the treatment must travel are more open than under summer air-seasoning. The different species also take treatment in a different manner and one treatment is better than another for a particular species.

As most treating plants are now equipped with adzing and boring machines which have attachments for various markings, it is possible, by running the species through separately, to have them marked to show the service for which they are best fitted. Orders can then be filled with the grade and species required. It is also easy for everyone handling the tie to see that it gets to its proper place. This prevents a branch-line tie from being inserted in a main-line track and a main-line tie from getting into a branch-line track, or an oil tie from being placed where a zinc-treated tie should be used and a zinc tie being put in where an oil tie should be used.

Must Adjust Expenses to Income

Railroads, like individuals, must restrict their expenditures to their income. It is not always possible to select the species and treatment that would be most economical. Rather, it is necessary to use the species and treatment that will come within the income available. It is often necessary, therefore, to determine the comparative costs of the different treatments in the different species, and then divide the money that is available to the best advantage. By having the grades and species separated, and knowing the costs of the different treatments, it is comparatively easy to determine the results and the annual cost of the different ties.

We meet different problems in treating Douglas or coast fir and Inland Empire fir. By incising, boring and adzing the Douglas fir and subjecting it to the Boulton process, we secure an excellent treatment that will give us the best results at the least cost. Our total elapsed time in treating fir by this process averages 19 hr. during the winter and 16 during the summer, the difference being due to the seasoning of the ties while they are being moved in open cars from the point of production to the treating plant. A large number of air-seasoned hemlock ties, treated by the Lowry process, have given a life of more than 19 years. Hemlock does not respond to artificial seasoning as well as fir, however, requiring at least 30 hr. by the Boulton process to obtain a satisfactory treatment. We have also found some unbalanced conditions in the interior of hemlock when artificially seasoned, caused by the pressure applied during treatment. Furthermore, the results are not uniform, since some specimens have a high net retention while in others the retention is low. We did find, however, that there is a consistent relation between the moisture content of the wood and the retention of the preservative.

Idaho fir and larch are still more refractory and do not take treatment satisfactorily. We have not yet succeeded in developing a process that will give the penetration and diffusion that we should have to insure a life corresponding to the expense involved. When these woods are incised, we find a saw-tooth penetration, varying with the depth of the incisor teeth, but with no diffusion along the ring growth. Research is being carried on actively and we are not discouraged; we believe that sooner or later a process will be developed for these woods which will give results equal to those now being obtained from the treatment of Douglas fir.

Must Insist on Good Practice

Treating-plant managements, as well as treating engineers, should refuse emphatically to be parties to any treatment that is not good practice. For instance, if oil is delivered to a plant which is known to be below grade, does not have the desired toxicity or does not give proper penetration, it should be rejected. Practices leading to excessive pressures or temperatures that are ruinous to woods should be prohibited. I realize that it is difficult for a commercial plant to oppose its customer, but retribution is sure to follow when improperly treated material is sent out, since failure to realize the anticipated life will mean a loss on the investment in the treatment and lead the managements of the railways or other users to the conclusion that treatment does not pay, as, of course, it does not if not properly done. This may result in the abandonment or curtailment of treatment, which will react on the commercial plant.

Under no conditions, not even those we are now facing, should ties be kept too long in the seasoning yards. If allowed to remain until decay sets in, the benefit of treatment and the cost therefor are lost. Any economy that might seem to be realized by delaying treatment beyond the safe limit is offset proportionately by loss of life in the tie. Ventures of this sort are easily covered up, but sooner or later the railroad must pay the bill.

Lining Up the Order Department

Ties should be ordered the same as any other material —a specific tie for a specific service and a specified place. Requisitions should be properly marked, and the ties shipped as called for. They can be loaded in such a way that they will be distributed and applied at their proper places. To get the right tie in the right place requires a study that must be completed months before receiving the shipping requisition. We have found that these factors can be determined largely by fall inspection and by knowing whether the work is to be done piecemeal, by a large gang or by a small section force, so that the orders may be drawn intelligently and the ties shipped in the quantities desired.

Engineers and roadmasters can count the ties to be renewed the ensuing season, study the drainage, the type of rail, the daily traffic and the cause of previous failure, and will then have all the information needed to enable them to make requisitions properly for the following year's tie requirements. Where there is any controversy over the distribution that is shown on the chart, another independent inspection can be made of the territory in question and the matter settled on its merits. The work of selecting the species and grades, getting the right treatment into the tie, placing the proper marking thereon, and obtaining the maximum return from each tie purchased, depends upon the correctness of the essential information supplied by those who order the ties.

(Continued on page 325)

Fighting Corrosion in Bridge Maintenance

Laboratory tests demonstrate the strength of welded connections of wrought iron plates to steel members and point to the advantage of using them in reinforcing work

By W. R. ROOF

Bridge Engineer, Chicago Great Western, Chicago

PROBLEMS of bridge maintenance that were not foreseen at the time that many of the older steel railroad bridges were built, have been introduced by the advent of heavy power and the increasing volume of refrigerated freight traffic hauled by the railroads. Because most of these old steel bridges were designed for lower loadings than they are now required to carry, and owing to the intensified corrosion that results from brine drippings from refrigerator cars, many of these structures are scheduled for replacement. On the other hand, there are many of these bridges that can still be repaired and strengthened to satisfy modern loading requirements.

Effect of Brine Drippings

To those responsible for the maintenance of steel bridges, corrosion due to brine drippings is a source of continual annoyance. Frequent cleaning and painting must be done to postpone the renewal of the affected parts, which oftentimes last about half as long as anticipated. On roads carrying heavy volumes of refrigerated traffic, track fastenings give half the life secured elsewhere, while damage to bridges is illustrated by the fact that a single road is now completing a program of bridge repair and renewal involving an expenditure of more than a million dollars, made necessary solely by this form of corrosion on a limited mileage of its system.

Progress in the art of electric welding has greatly simplified the problem of applying additional metal to old bridge members, either to increase their strength for heavier loading or to replace metal destroyed by corrosion. The Chicago Great Western was one of the first railways to use electric welding for this purpose, and it has since been employed so extensively on various roads that rules of good practice covering the application of new metal under almost every conceivable requirement are now well established. The economy of using electric welding in strengthening steel bridges is now generally recognized.

One of the most common applications of the process is in the welding of cover plates to the top and bottom flanges of floor beams and stringers, because floor members are more frequently overstressed than any other part of an old bridge. Moreover, the drippings from refrigerator cars have a particularly corrosive effect on the top flanges of floor members, thereby necessitating the addition of new metal.

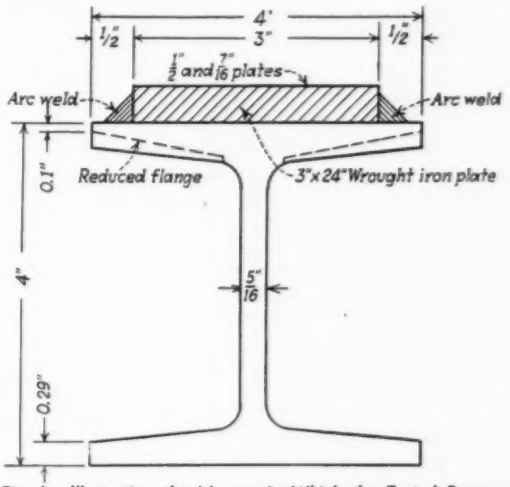


Fig. 1. Illustrating the Manner in Which the Tested Beams Were Prepared by Reducing the Flange and Welding on a Wrought Iron Plate

The selection of material to be used in the reinforcement of old bridges, especially those that are subject to the action of brine drippings, is of the utmost importance. Steel is not to be recommended for this purpose because practically all the bridges that require reinforcing are of steel which is affected by brine drippings. It has been observed that members of old wrought iron bridges, which have been subjected to the action of brine drippings, have suffered little reduction in sectional area, and even after many years exposure such structures are still in good condition. Most bridge engineers will recognize this to be a fact from their own experience because nearly every railroad still has some old wrought iron bridges in service.

Summary of Test Results

Test No.	Description	Weight, Pounds	Maximum Load, Pounds	Maximum Deflection, Inches	Load at Yield Point, Pounds	Relative Safe Strength	Deflection Under 1000 Lb. Load, Inches	Relative Stiffness
1-A	Original section	41.20	40,000	3½	20,800	1.00	.045	1.000
4-A	Reduced flange in tension	38.80	37,000	3½	22,700	1.09	.062	.726
7-A	Reduced flange in compression	38.20	36,000	4	19,800	.95	.055	.818
6-A	Reinforced flange in tension with ½ in. cover plate	48.95	42,700	1¾	28,700	1.38	.066	.682
8-A	Reinforced flange in tension with ½ in. cover plate	49.40	43,000	2⅛	27,000	1.30	.058	.776
3-A	Reinforced flange in compression, ½ in. cover plate	50.10	48,500	3¾	23,700	1.14	.050	.900
5-A	Reinforced flange in compression, ½ in. cover plate	49.20	47,500	2¾	25,300	1.22	.051	.882
9	Reinforced flange in tension, 7-16 in. cover plate	49.50	45,800	2½	29,600	1.42	.055	.818
10	Reinforced flange in compression, 7-16 in. cover plate	49.00	49,450	3½	25,800	1.24	.043	1.045
10-A	Reinforced flange in compression, 7-16 in. cover plate	47.20	45,000	2⅜	19,400	.93	.051	.882

In view, therefore, of the resistance of wrought iron to brine drippings, and since wrought iron plates are now available at reasonable cost, it is logical to consider seriously the use of this material for cover plates at those points on steel bridges where corrosion from salt brine is a factor. This conclusion focuses attention on two important questions, namely; (1) will wrought iron restore the necessary physical strength, and (2) can wrought iron be satisfactorily welded to steel? In order to answer these questions, a series of tests were made by a testing laboratory on steel H-beams having welded

Fig. 2. Typical Failure of a Test Specimen

wrought iron cover plates. These plates conformed to the American Society of Testing Materials Specification A 42-30, Class A, and the writer developed the design of the test specimens.

Test Specimens

Bending tests were made of 4-in. H-beams weighing 13.8 lb. per ft. and having a length of 36 in., the beams being rested on supports 33 in. apart and subjected to a concentrated load at mid span. The tests included (a) full-size beams; (b) beams with one flange planed down to represent the reduction in area due to corrosion, and (c) reduced-flange beams reinforced by arc-welded wrought iron cover plates on the reduced flange. Part of the beams used in groups (b) and (c) were tested with the altered flange in tension and the rest with the altered flange in compression.

In Fig. 1 is shown a typical section of the tested beams, illustrating the manner in which the flanges were reduced and showing the method by which the section was restored by the use of arc-welded wrought iron cover plates. A view of one of the specimens, with a restored flange, after being subjected to the compression test, is shown in Fig. 2. The arc-welding of all specimens was found to be intact after failure of the beams, even though actual ruptures of the steel beams occurred in some cases. Tabulated results of the tests are shown in the table, while Fig. 3 is a graphical representation of the results, these records indicating that arc-welded wrought iron cover plates function in a satisfactory manner.

Figures 4, 5 and 6 are photomicrographs showing the junction of the wrought iron and deposited metal, the deposited metal, and the junction of the steel beam and the deposited metal, respectively. In preparing the test specimens, the same general procedure was followed as

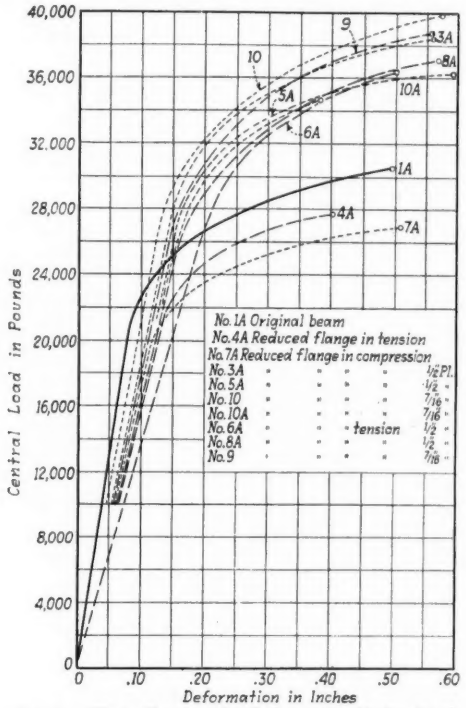
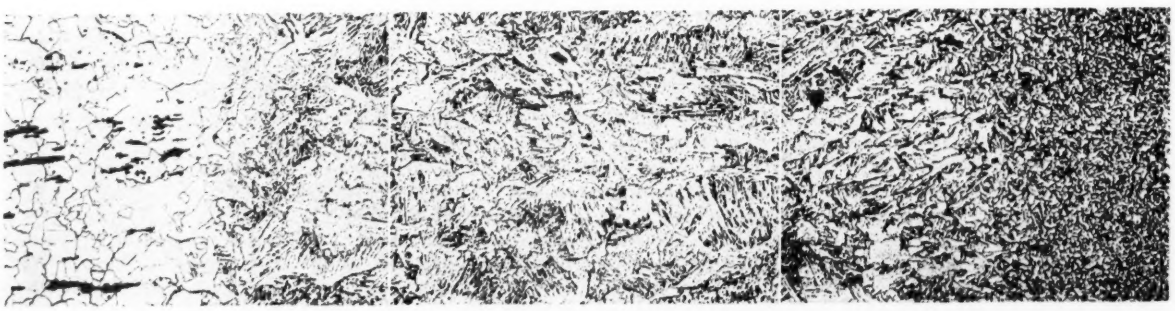


Fig. 3. Chart Showing the Deformation Under Load of the Various Test Specimens

in actual restoration and reinforcement work, except that the width of the plates was selected to permit downhand welding. Although of the same cross-sectional area, the tension plates were wider and thinner than the top or compression plates.

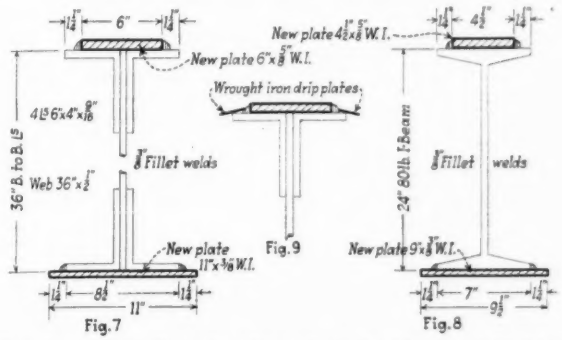
The method of applying wrought-iron cover plates by means of the arc-welding process to built-up stringers and floor beams is shown in Fig. 7, while Fig. 8 illustrates their application to rolled sections used for floor beams and stringers. Figure 9 shows a slight modification of the method used where it is desired to secure complete protection of the top flange from corrosion, by the application of wrought iron drip plates.

An analysis of the results obtained, as shown by the photomicrographs and stress curves, satisfactorily answers both of the questions regarding the use of wrought iron that were stated at the beginning of the



Photomicrographs magnified 60 Diameters of a Wrought Iron Plate Welded to a Steel Beam. Fig. 4 at the Left Shows the Junction of the Wrought Iron and the Deposited Metal, Fig. 5 in the Center Shows the Deposited Metal, and Fig. 6 at the Right Shows the Junction of the Steel Beam and the Deposited Metal

article, and indicates that a judicious selection and combination of materials is both feasible and practical. These test results were later confirmed on a larger scale in connection with a bridge repair program where it was found that no difficulty was experienced in welding various combinations of wrought iron and steel. In this work six welders on three bridges made a total of 18 fillet welds on wrought iron and 8 fillet welds on steel. The fillets were 5/16 in. and were proportioned for an assumed working stress of 2,500 lb. per lin. in. For the



Figs. 7, 8 and 9. Illustrating, Respectively, the Method of Applying Wrought Iron Cover Plates to Built-up Stringers and Floor Beams, Their Application to I Rolled Sections, and a Slight Modification of the Method Where It is Desired to Secure Complete Protection of the Top Flange From Corrosion

wrought iron the average weld value was 9,280 lb. per lin. in. and for steel 9,520 lb. per lin. in.

From the test results obtained and the well-known resistance of wrought iron to corrosion, it is evident that the application of wrought iron plates offers an economical method for the rehabilitation of existing steel railway bridges. The recognition and utilization of the inherent values of these two materials is sound engineering practice, a practice already exemplified by the practice of railroad engineers who base their selection and specification of materials on authentic service records. The known record of the behavior of any material under well defined operating conditions is a safe guard to follow.

Preparing a Crosstie Program

(Continued from page 322)

During the discussion which followed the presentation of this paper, and in answer to a question regarding the relative economy of natural seasoning and the artificial method mentioned in the paper, Mr. Curtis said that this is a matter of mathematics that must be worked out for each situation and that no general statement could be made. Furthermore, in every case, any difference in the costs of the two methods must be balanced with other factors, including the storage space available, the cost of handling, the necessity for meeting a demand for quick availability and other items which might influence the decision. He then requested J. B. Card, president of the Indiana Wood Preserving Company, to outline the method of artificial seasoning which is being employed by the Milwaukee.

Mr. Card then stated that ties which have been air seasoned from three to six months are placed in a retort and immersed without pressure in a 50-50 creosote-petroleum mixture, with an initial temperature of about 180 deg. The temperature is then raised to 200 to 212 deg. and held for four hours or more, sufficient to heat the tie uniformly to its center, after which the oil is drawn back to the storage tank. It has been found that as the temperature of the wood rises, the moisture in the timber is vaporized and, as it escapes, the preservative replaces it. After four hours, there is a surface zone which is partly impregnated with the preservative, this being an essential part of the process.

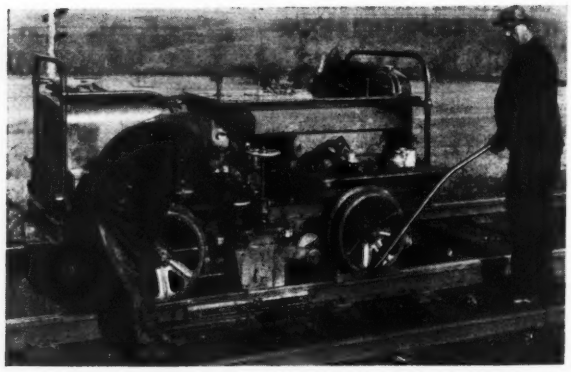
As soon as the initial bath has been drawn from the retort, a draft of hot air is blown through the cylinder to reduce still further the moisture content of the wood. This air is recirculated through the charge of ties by means of a fan and a duct outside of the retort, but connected with it at each end. The fresh air is heated to a temperature of 180 deg. by passing it over steam coils. Similar coils are located in the duct, so that as the air is being recirculated it is raised to a temperature of 200 to 212 deg., thus increasing its ability to absorb moisture. As it becomes saturated, it is drawn from the retort by a second fan and replaced by fresh heated air, the discharge of the saturated air and its replacement with fresh air being carried on simultaneously as a continuous process, the recirculating air constantly passing over the heating coils in the duct to maintain it at the desired temperature. This drying process is continued until the moisture is reduced to a point sufficiently low to permit a thorough impregnation of the wood with the preservative. This part of the process requires an average of four hours for timber that has had an initial period of three to six months' air seasoning. Obviously, freshly cut timber will require additional time. When the moisture content of the wood has been reduced to the desired level, the creosote-petroleum mixture is returned to the retort and from this point the standard method of treatment is followed.

Mr. Card said that black oak, red oak, gum and beech ties have been treated in this manner with excellent results, with a total elapsed time averaging 12 hr. Owing apparently to the relatively low temperature and to the fact that the escape of the moisture is somewhat retarded by the initial infiltration of the preservative, the ties thus treated have shown less tendency to check and split during the after-treatment period of seasoning. Furthermore, since the channels throughout the wood remain more open as a result of the relatively short period of air seasoning, a better diffusion and deeper penetration of the preservative are secured.

On the Missouri Pacific in the Flint Hills of Kansas

Evening Up Rail Ends by Grinding

Large road uses reciprocating machine for equalizing more than 40,000 joints in new as well as built-up territory



Grinding Away the Inequalities in Rail End Heights

CONVINCED of the detrimental effects on track, on rail joints and on the rails themselves, of other than a perfectly uniform elevation of abutting rail ends, certain roads are now experimenting with a plan of grinding away all unevenness or irregularities at these points, whether found in new rails or where the rail ends have been built up by welding. These roads are using a reciprocating type grinder in this work, which has been found to be highly effective. This article will deal largely with the work of this type of grinder on the road which has had the largest experience in its use, a road which has already used the grinder on more than 40,000 joints in both new and welded track.

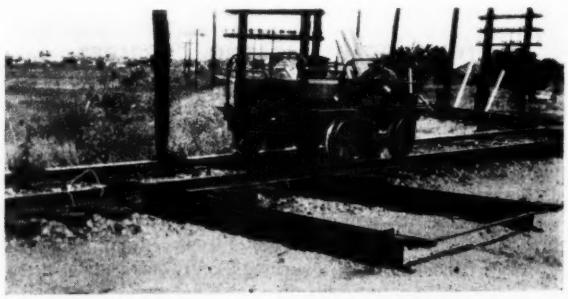
Equalize Rail End Heights to Retard Batter

Careful measurements on the road in question have shown that the tolerances allowed in the manufacture of new rails and bars commonly result in a difference of 0.015 in. in the heights of abutting rail ends and, not infrequently, in differences of as much as 0.030 in. Convinced that such inequalities are an important factor in the development of rail end batter, this road has, during the last ten years, tried to find a suitable track grinder to eradicate them.

Late in 1931 the road purchased a reciprocating type grinder for this purpose, the unit being the first of its kind developed for steam railway use, although this same type of machine has been employed for many years by street railways in smoothing up rail ends and in removing corrugations in rails. Using this machine early last year, the road followed up the laying of 16 track miles of new 110-lb. rail, grinding all joints where there was any measurable difference in rail height. In all, approximately 1,450 joints were leveled and it is said that the results surpassed expectations in the quality of the grinding work performed and also in the speed with which the work was accomplished.

On another stretch of track in which new rails had been in service for about two years, the grinder was used to remove many differences in rail heights which still existed, the work here involving 668 joints. With batter already at some of the joints, the grinder was used to remove the abrupt depressions in the rail ends, as well as to true up the rail ends. Feeling that the initial inequality in rail heights at these joints had been an important factor contributing to the development of batter, it was expected that the removal of the inequalities, even at that late date, would completely overcome the effect of this influence.

Going a step further, this road has utilized the grinder to put the finishing touches on rail ends built up by the arc welding process, following the usual grinding of the welds with a rotary type grinder. This road has found it practically impossible to provide a perfectly smooth finish for the weld surface by means of rotary grinders, experience showing that even the most skillful operators leave a slightly uneven surface, with high and low spots which detract from smooth riding qualities, and which, in the opinion of the road, are detrimental to the repaired rail ends. To overcome this situation, and at the same time retain the higher efficiency of the rotary grinder in roughing off the surplus metal of the welds, the reciprocating grinder is used only in a follow-up operation after the rotary grinder, and has the effect of ironing out any irregularities still left in the surface of the weld. More than 40,000 joints have been finished in this manner. Best results are obtained with the final operation following four to eight weeks after the welding and rough grinding. During large scale rail welding work, the reciprocating grinder has also been used in the leveling of rail ends at joints with too little batter to justify their being built up by welding.



The Derailing Frame in Position for Use

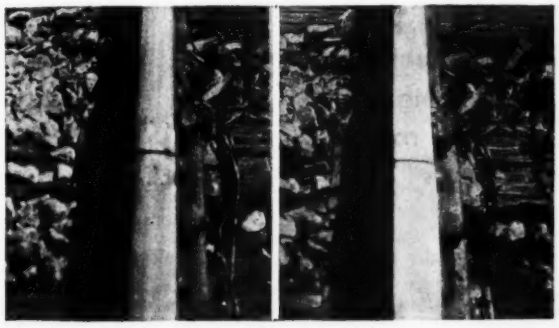
The reciprocating grinder used in the work described has been developed by the Railway Track-work Company, which unit was described in *Railway Engineering and Maintenance* for December, 1931. As pointed out at that time, the unit consists essentially of abrasive blocks mounted on both sides of a specially equipped motor car, the blocks lying directly over the rails and being contained in a cross-head holder which is given a reciprocating motion longitudinal to the rail. The blocks, which are 10 in. long by 4 in. wide and 3 or 3¼ in. thick, are held down against the surface of the rail head by means

of a coil spring and, since they quickly assume the normal contour of the rail head, they grind the full top face of the head in accordance with its normal shape, smoothing off any irregularities present.

The grinder car, which weighs approximately 4,500 lbs. when equipped for operation, and which is suited for transporting the welding gang from place to place, is readily derailed to permit the passage of trains, by means of lifting jacks integral with the car body, the lower ends of which are equipped with rollers for moving the car transversely over a steel channel derailing frame.

Costs Vary with Extent of Grinding

The time and expense involved in the refinement of rail end conditions through the use of the reciprocating grinder have varied, as might be expected, with the extent of the grinding necessary and the interference occasioned by traffic. On the sizeable job mentioned, in which approximately 1,450 joints in new rails were leveled, the time required at each joint, with the normal



Welded Rail Ends Before and After Grinding with the Grinder

force of one man and a helper operating the grinder, was from three to five minutes. The labor cost per joint, not including manual flag protection, which was not necessary in this work, was 8.1 cents, and the cost of the supplies utilized per joint, including gasoline, lubricants, grease and grinding blocks, was 1.85 cents. Combining these figures, the total cost per joint was approximately 10 cents, exclusive of interest and depreciation charges.

Experience in the work described indicated that the smoothing up of electric rail end welds requires a little more time than the leveling up of new rail ends, and, further, that the wear of the grinding blocks is ordinarily more severe. However, on a particular stretch of weld grinding covering 1,396 joints, it was found that the cost of the work was actually a little below the average cost of grinding new rail ends. It is pointed out that this especially satisfactory piece of work was due largely to the unusually high quality of the preliminary grinding done with the rotary grinding equipment used with the welding outfit, and that the experience of the road as a whole indicates that the cost of the finishing grinding of welded rail ends will run approximately 25 per cent higher than the cost of smoothing up new rail ends.

On another road, the reciprocating grinder has been used successfully in removing corrugations from rails. In this work, which was done under heavy traffic, clearing for all trains, the depth of corrugations ranged from 0.006 to 0.013 in., with a distance between troughs or crests of the wave-like surface ranging from 2½ to 3 in. Using the grinder in much the same manner as in finishing rotary-ground welds at rail ends or in evening up unwelded rail ends, the corrugations were removed at an average speed of 65 lin. ft. of rail an hour of actual grinding time. The total cost of this work, which included the wages of the operator, one helper, two flagmen and one phone man, and the expense involved for grinding blocks, fuel and lubricants, repairs, depreciation and interest on investment, was 10.7 cents per lin. ft. of surface ground.

Pennsylvania Considers Auto Truck for Maintenance Work

A LIGHT motor truck with standard wheels and tires supplemented by four small steel flanged wheels with retractable mounting, and capable of running with equal ease on either the highway or railroad track, is being tested by the Pennsylvania at Pittsburgh, Pa., for use in track maintenance work. The truck is a standard make half-ton vehicle, to which the four flanged wheels, two ahead and two to the rear, in line with the tired wheels, have been applied in an arrangement which is simple of construction and which permits ready adjustment for either rail or highway travel.

When the truck is to be moved over the highway, the

The Half-Ton Rail-Motor Truck, for Both Rail and Highway Operation Being Tried Out on the Pennsylvania

flanged wheels are retracted upward and ride about four inches above the surface of the road. When it is to be moved over the track, it is lined up on the track rails at a road crossing and the flanged wheels are then lowered to form a guide for the rubber-tired wheels. In operation on the track, the load is carried entirely by the tired wheels, since the treads of the small steel wheels are designed to be lowered only to within one-quarter inch of the running surface of the rail. The small wheels are capable of carrying the load, but this factor is taken advantage of only in case one of the regular wheel tires becomes punctured. In this event, the load is transferred immediately to the small flanged wheel adjacent to the punctured tire, with only a drop of the one-quarter inch clearance normally provided between the tread of the flanged wheel and the rail.

It is said that if the present tests are successful, the truck will be used by the track forces in moving from place to place in the handling of tools, materials and supplies. In many instances, it is expected that such use of the truck will save considerable time and expense, permitting direct movement between storehouses or other supply points, off track, and any point on the track, and, also, taking advantage of short cuts offered by high ways.

Reservoirs on the Illinois Central Have Been Developed to Provide an Ample Reserve Supply.

Modernizing Water Facilities

How changing conditions and improvements in equipment have made the remodeling of pumping stations on the Illinois Central a matter of routine during the last 20 years

WITHIN the last two decades, the Illinois Central has remodeled and enlarged 129 steam-operated water stations, installed oil or gasoline engines at 55 stations and supplanted steam with electric power at 30 others, in addition to installing combinations of two or more of these sources of power in 17 plants. Also, 34 plants for the treatment of water have been constructed, which are treating 2,000,000,000 gal. annually. For these and other modernization purposes, this road has expended approximately $5,000,000 on water stations in this period of 20 years.

This record is significant as indicating the constantly changing conditions confronting railway managements in meeting new conditions by reason of the fact that during the 20 years from 1893 to 1913, practically all of the water stations on this road had been rebuilt. As a result, in 1913 the Illinois Central, with its 6,133 miles of lines, was operating approximately 300 water stations, practically all of which were relatively new, with power plants and pumps adequate to meet normal demands. At that time, steam pumps were still used almost exclusively and since the equipment was being maintained to a high standard, relatively little of it was worn out.

Station Records Indicate Need for Modernization

It was assumed that these facilities would not require remodeling for many years and that replacement of worn equipment and routine maintenance would represent the needful activities of the water service department for some time to come. Yet, the precaution was taken to compile accurate records of the man-hours of attendance and overtime at each water station and to study these figures in connection with their monthly unit costs of operation. Used in this way, these figures offered an immediate index of the advisability of making further changes that would produce greater economy, and a surprisingly large number of cases were continually brought to light where costs could be reduced materially by additional remodeling of the station and the installation of more modern equipment to meet new operating conditions or to take advantage of new developments in machinery and power.

In general, under normal conditions the department has considered that it is justified in recommending the modernization of a plant if a saving of 10 per cent or more can be assured. In making the studies leading to such recommendations every case is considered as an individual problem to be solved on the basis of local conditions, rather than in accordance with any preconceived formula or inflexible standard with respect to power or pumping equipment.

Numerous cases have been found where economy can be obtained by replacing steam pumps with more modern steam units. It has been found that where boiler plants must be maintained for other purposes, as for the heating of buildings, it is usually more economical to utilize this form of power. Of the 353 stations now in active operation, water is taken from municipal or industrial supplies or private water companies at 114 stations, leaving 239 stations which are built and maintained by the railway, although rehandling pumps for distributing the water are required at numerous points where water is purchased.

In general, the department favors the electric pumping station, operated either automatically or under push button control, wherever it is practicable, although three factors have prevented its wider adoption: (1) Lack of available power or the necessity for expensive construction to reach a power line; (2) a record of frequent interruption to service, dependability being fundamental; and (3) excessive demand and consumption rates.

Water Shortage Develops

There were other reasons, however, why the modernization of many of the water facilities on this road were undertaken. Despite the fact that during the preceding 20 years the water department had been bending its energies toward creating ample reserves at all stations

and particularly at those of greatest importance, one of the first problems to demand attention almost at the beginning of this period was that of combating water shortages, which were beginning to develop with the increase in traffic. This trouble was particularly acute in Southern Illinois and Western Kentucky.

As an illustration, between Centralia and Carbondale, 56 miles, there were three intermediate water stations, at Bois, Duquoin and Hallidayboro. At Centralia, the railway began about 1912 to take water from the city, which had just completed a large impounding reservoir, and this supply still remains ample for all purposes.

At Bois there was a 45,000,000-gal. reservoir impounding excellent boiler water, which supply was supplemented by pumping from the Little Muddy river, the water from which is of fair quality. While no actual shortage had as yet occurred at this point, the river was not dependable for more than six months of the year and often not for more than three, so that there was always danger of a shortage. During this period floods were frequent and the amount of suspended matter in the water was high. It had been found also that the watershed was frequently unable to keep the reservoir filled. In addition, the steam-operated plant, which had supposedly been designed to care for traffic increases for 40 or 50 years, was becoming too small to care for normal demands, let alone peak loads or periods of water shortage at Duquoin.

Duquoin also had an impounded supply which was of good quality and ample for the traffic conditions when it was built. As the mining activities in the Saline County district increased, Duquoin became the concentration point for a very large tonnage of coal. The resulting demand on the water facilities was beyond their capacity and it became necessary to haul as many as 1,000 cars of water a month to this station.

From Duquoin to Carbondale is 20 miles. Hallidayboro, about half way between, has an impounded supply of 100,000,000 gal., but since this was an emergency station it was little affected.

On the other hand, Carbondale, which is not only the junction with the lines to St. Louis and Paducah, but is also the concentration point for coal from the Williamson county district, is one of the most important water stations on the system. Here the supply, which was taken from the Big Muddy river 4½ miles north of Carbondale, was ample but the quality was bad. This stream, as its name implies, carries a heavy load of silt at all times, but particularly during the winter and spring. During high stages the water is low in dissolved solids, but during the summer months the matter in solution is very high. With the increasing tonnage that was being handled, it became imperative to provide a boiler water of better quality.

How the Problems Were Solved

These then were the problems that began to confront the water department at three adjacent points where it had been supposed that the facilities were ample for another generation. Very comprehensive investigations were made to determine the best and most economical solutions of the individual problems, at the same time keeping in mind that each one was only a different phase of a larger problem.

At Bois it was determined that an additional reservoir and the necessary pumping facilities would cost between $175,000 and $200,000. It was decided, therefore, to replace the old steam plant with a duplicate installation of 25 hp. semi-Diesel oil engines, belt-connected to 500-g. p. m. centrifugal pumps, and replace the original 6-in. pipe line with a 10-in. cast iron pipe line. The new plant and piping are so arranged that during high stages in the river, water can be pumped to fill the reservoir and held in reserve for the period when the flow is insufficient to meet the demand.

At Duquoin the ground water is wholly unfit for boiler purposes. Since there was no stream to draw on, as at Bois, it became necessary to construct a new reservoir in an adjacent valley, thereby raising the total storage to 200,000,000 gal. Here also more modern equipment as well as greater capacity was desired, and the steam plant was replaced with a duplicate installation of 25-hp. semi-Diesel engines and centrifugal pumps. To correspond with the increased pumping capacity, the original 6-in. cast iron pipe line was replaced with an 8-in. line 1½ miles long. This project cost $158,000.

As explained, Carbondale presented a different problem which could be solved only by an improved water. At this point, therefore, an intermittent lime-soda ash plant for treating and filtering the water was installed

One of the Duplicate Oil Engines and Centrifugal Pumps at Duquoin

and the pumping capacity was increased, the steam plant being retained. The water was formerly pumped through three miles of 8-in. and one mile of 12-in. cast iron pipe, the former being replaced with a 12-in. pipe in connection with the remaining improvements.

As an illustration of the fact that conditions at a water station seldom remain fixed for any considerable time, it is interesting to note that at this station the pumping facilities and boiler plant were rebuilt and four miles of 6-in. pipe line, replacing the original 4-in. line, was laid about 1895. This pipe was replaced by an 8-in. line in 1906, and larger pumps were installed to care for the increased and growing demands for water. Later, one mile of 12-in. pipe replaced an equal amount of the 8-in. line. The rebuilding of the plant, the construction of the treating and filtering facilities, and the installation of the remainder of the 12-in. pipe occurred in 1918. It is of further interest, therefore, to note that within 10 years of this latter date, pollution from mine drainage became so serious that a new source of supply was becoming necessary. At this time, the city of Carbondale, which had had an inadequate supply of water of poor quality, completed an impounding reservoir having a large reserve capacity of soft water, so that the railway has abandoned this important pumping station and now takes its water, approximately 100,000,000 gal. a year, from the city.

In the 20 years subsequent to 1900 there had been

a marked advance in the equipment for and methods of deep well pumping. At an earlier date, steam pumps, many of which were of low efficiency, provided the only means of obtaining water from deep underground sources. Paxton, Ill., therefore, provides another example of the changing conditions and the almost constant need for modernization of facilities which confront the water service department of a busy road and affords a typical illustration of the manner in which the Illinois Central has solved the problem of many of its underground supplies. Originally this water station was located on a small creek four miles south of town. The old station was abandoned about 1900 because a drainage ditch which followed the course of the creek imperiled the supply. To replace it, a new steam-operated plant, which obtained its water from three 10-in. wells, was built at Paxton. Eventually the increase in traffic had so narrowed the margin of safety that this station, in addition to its recognized inefficiency, was not entirely dependable.

About 1923, advantage was taken of a grade reduction at this point to relocate the plant about a mile north of the station, where new passing sidings had been constructed. The topography of the country made a reservoir impracticable, but exploration indicated a water-bearing stratum at a depth of about 150 ft. Two gravel-wall wells were constructed and equipped with 14-in., 5-stage, vertical turbine pumps, each driven by a 30-hp. motor which is automatically controlled from float switches in the tank. These two wells are supplying three times the volume of water that could be obtained from the three earlier wells, while the cost of pumping has been reduced from 18 cents a thousand gallons to 6 cents.

Similar Example at Clinton

Clinton, Ill., a terminal where four important and one secondary districts terminate, provides a somewhat similar example, but on a larger scale, that conditions in the water supply field are undergoing a constant change and that modernization is often necessary where least expected. In this case, in addition to modernizing the power and pumping equipment, water-treating facilities were necessary which required additional power units and pumps. Originally, the supply for this plant was obtained from an impounding reservoir near the shop, but by 1900 this supply had been outgrown and a new steam-operated pumping station was built at a creek four miles to the south and water was pumped to the reservoir through an 8-in. pipe line. Larger pumps were also installed at the shop power plant to provide distribution for the yard, engine terminal and shops. By 1915, water shortages were again occurring during the summer months and eventually became so acute that an additional supply became necessary. An abundance of water is found at this point at a depth of about 350 ft. Accordingly three wells, 18 in. for 200 ft. and 10 in. for the remainder of the distance, were constructed.

Each well was equipped with a five-stage turbine pump having a 7-in. suction and a 9-in. discharge, which is driven by a vertical 85-hp. synchronous motor. Each well is also equipped with an automatic control panel located in the pump house. These panels have starters, overload and no-voltage protection, as well as automatic and push-button control, the latter being arranged so that the pumps can be started or stopped from the water-softening plant. Under normal conditions, however, the control is entirely automatic by means of float switches in the service tank and the treating-plant clear-water wells. An additional motor-driven centrifugal pump handles the chemical solution for the treating plant and three similar service pumps handle the water from the reservoir to the treating tanks and from clear-water wells to the service tank.

Modernization Cuts Operating Cost in Half

Another situation was met at Kankakee, Ill., which further illustrates what this road has accomplished in the way of modernization and how equipment that is now considered adequate may become obsolete in a relatively short time. At this important station constant increase in traffic with a consequent growth in the use of water had been such that the existing steam plant became inadequate and it was proposed to enlarge it. After a careful study of the situation, it was decided to abandon the steam operation and install automatically-controlled electrically-driven pumps. Although the cost was slightly in excess of that for additional steam facilities, the installation of the motor-driven units made it unnecessary to increase the size of the building, while the automatic control made the services of two pumpers unnecessary, and the cost per thousand gallons of water delivered was reduced from 8 cents to 4½ cents. A similar installation at another point, which replaced a steam pump and a gasoline-engine unit, made it possible to place the plant under the supervision of the coaling station foreman, thus dispensing with the services of two pumpers.

All Electrically-Operated Stations Are Automatically Controlled

These illustrations could be repeated indefinitely, but enough has been given to show the character of certain of the problems and the manner of their solution. Since they are typical, it is clear that although the pumping stations and their equipment were in good physical condition 20 years ago; that while water supplies had been developed after careful consideration and in the belief that they would be adequate for years to come, and that despite a high standard of maintenance,—unforeseen changes in traffic necessitated a complete rebuilding of many plants and the enlargement and partial rebuilding of others. Furthermore, other plants where the supply of water was ample and the pumping equipment had sufficient capacity to meet all demands have been modernized in the interests of more economical operation. In still other cases, where it was not deemed advisable to retire the existing equip-

(Continued on page 337)

What's the Answer?

Have you a question you would like to have someone answer?

Can you answer any of the questions listed in the box?

To Be Answered in September

1. *When making a track inspection from a motor car, what indications of irregular gage are to be observed?*
2. *Does a northern or a southern exposure cause paint to deteriorate more rapidly? Why? What measures can be taken to retard this action?*
3. *How should adzes be sharpened? To what extent can this be done by section or bridge forces? What form of grinding wheel is most satisfactory?*
4. *What are the characteristics of a good solder? What methods should be used in applying it? What precautions are necessary?*
5. *At what intervals should track be surfaced out of face? Does the character of the traffic or of the ballast make any difference?*
6. *How frequently should water tanks be inspected? Who should make the inspection? What items should be observed and in what detail should the record be kept?*
7. *Is there any advantage in using longer ties off the ends of open-deck bridges? If so, what? Over what distance should they be used?*
8. *What should be the relative height, as compared with the running rails, of the inner guard rails on bridges? Why? How far should they be placed from the running rail? What determines this distance?*

Spiking New Ties

How soon after insertion should a new tie be spiked? Why? Does the kind of ballast or the use of tie plates make any difference ?

Safety Should Be First Consideration

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This question touches a matter about which there is a wide diversity of practice. Two primary aspects are involved. First, there is the question of prolonging the life of the tie. Obviously, a tie that is spiked and respiked will not have the same life as one that does not receive this abuse. The second consideration, that of safety, hinges in part on train speeds and weights.

In these days of high speeds, dense traffic and heavy loading, no part of the track structure can be weakened with impunity. Since the pre-adzing of ties is nearly universal, there is nothing to prevent the gaging of the rail and the spiking of the tie as soon as it is inserted. This forestalls the necessity of pulling the spikes later for the purpose of gaging. So far as I see, the kind of ballast has no influence on when the spiking should be done.

Some roads leave new ties unspiked until a number of trains have passed and settled them, after which they place the tie plates and do the spiking. Others tamp the tie and place the tie plates immediately, springing the track enough to permit the plates to be inserted. My own thought is that, regardless of whether tie plates are used and of the method of placing them, a new tie should be spiked as soon as it is inserted.

Should Be Spiked at Once

By H. E. HERRINGTON

Section Foreman, Minneapolis & St. Louis, Jordan, Minn.

As I view the matter, it is axiomatic that new ties should be spiked as soon as they have been tamped, and that the tamping should be done immediately upon insertion. If tie plates are to be applied and the ballast is of the finer or looser types, such as cinders, gravel, granulated slag or burnt shale, the tamping should be done before the tie plates are applied. To do this it is necessary to spring the track slightly, but as it settles under traffic it will come to proper surface and rest on a more solid foundation. If, on the other hand, the ballast is coarser, such as washed gravel, crushed rock or any of the smelter slags, the plates should be inserted and the tie spiked before the tamping is done, as these types of ballast do not compress as easily as the finer and looser materials.

Depends Somewhat on Circumstances

By District Engineer

I have never made a hard and fast rule with respect to spiking new ties because the conditions under which they are inserted vary so widely. Obviously it is desirable to complete the spiking as soon as practicable. Where large numbers of ties are renewed in connection with new rail or ballasting, it is usually advantageous to organize the gang so that the gaging and spiking will follow closely behind the insertion of the ties. In these

cases all ties are to be tamped so that the kind of ballast or the use of tie plates makes no difference.

At the other extreme, in ordinary renewals, where treated ties are in use, the insertions may average less than one to a rail. In this case, if tie plates are not used the spiking should be done at once. If tie plates are to be used, and the ballast is gravel or any of the finer materials, there may be an advantage in delaying the spiking until several trains have passed and the ballast under the tie is compacted. The rail should then be lifted enough to insert the tie plate, after which the tie should be spiked. If the ballast is stone, slag or coarse washed gravel the tie plates should be placed and the spiking completed before the tie is tamped, since these materials compress very little.

▼ ▼ ▼

Seasoning Bridge Timbers

For what period should bridge timbers be air-seasoned before treatment? Why? Does the kind of wood or time of year make any difference? What are the effects of overseasoning? Of underseasoning? How can the checking of timbers be overcome ?

No General Rule Can Be Laid Down

By L. H. HARPER
Superintendent Creosote Plant, Central of Georgia, Macon, Ga.

Since the kind of wood and the location of the seasoning yard have so much to do with the time of seasoning, no general rule can be laid down. In the South we find that yellow pine timbers require from three to four months in the summer and up to five months in the winter, depending to some extent on the particular species of pine, the size of the timber, the amount of sapwood, and, obviously, the kind of weather. There are two reasons for air-seasoning timber before treatment: first, to reduce the moisture content of the wood as much as possible, so as to make it more receptive to the preservative; second, to allow seasoning cracks and checks to open up before rather than after treatment.

The effects of underseasoning are, therefore, that the penetration of the preservative is poor and irregular, and that when the treated timber is installed in service the seasoning cracks continue their development and allow water and decay-producing organisms to reach the untreated wood, causing it to rot quickly. If the timber is overseasoned, fungus develops in the sapwood and decay starts before it can be treated.

End checking is not so serious a problem in pine timber as it is in some other woods. Excessive side checking occurs in very hot weather, however, but usually only in the timbers on the top row of the stack. It can be controlled to some extent by having these pieces turned occasionally so as to expose a different side to the sun.

Many Factors Affect the Time of Seasoning

By H. R. DUNCAN
Superintendent of Timber Preservation, Chicago, Burlington & Quincy, Galesburg, Ill.

Many influences affect the time required for the air seasoning of bridge timbers prior to treatment. They include the species of wood, the location of the seasoning yard and the time of year, while the temperature, humidity, volume of rainfall and the velocity of the wind are equally important factors. In the South, southern pine seasons satisfactorily in from two to six months. In the north an appreciably longer time is usually required by this wood as well as other species.

When fir is overseasoned, excessive checking, splitting, twisting, warping and case-hardening are frequent results. If the timber is case-hardened, it is difficult, and often impossible, to secure a satisfactory penetration of the preservative. If, in an effort to secure satisfactory penetration, the timbers are held under high pressure and temperature for a long period there is danger of a collapse of the wood structure. There is also danger of additional checking and splitting during the treating period.

If pine is overseasoned, some case-hardening may result and, to a less degree, the other effects may occur that were mentioned in connection with fir. In addition, there is always the danger of internal decay in overseasoned pine timbers.

If the same methods are used for treating underseasoned wood of any species as are used for timbers that are properly air seasoned, we can not expect satisfactory penetration of the preservative. After treatment we can expect progressive checking and probable exposure of untreated wood and, logically, premature decay. It is possible, however, to substitute artificial seasoning for air seasoning and by this means secure well-treated timber. It is the opinion of many authorities that when fir is seasoned artificially by boiling in a vacuum a more satisfactory penetration will be obtained and that less ultimate checking will occur than is possible with the usual methods of air seasoning and treatment.

My experience leads me to believe that it is impossible completely to overcome the checking of bridge timbers. We purchase fir for this use, and after considerable experience we have concluded that we are able to overcome this tendency in part by insisting that the timbers be cut outside of the heart. In other words, the cut must be removed at least two inches from the pith. While this has not entirely eliminated the checking we believe that this requirement and the proper supervision of the timbers while seasoning have had a very beneficial effect.

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Lining Track

When ballasting, or making a general raise without applying new ballast, and renewing ties, should the track be lined ahead of the surfacing? Why? How closely behind the surfacing should the final lining follow ?

Seldom Necessary to Line Ahead of Surfacing

By E. L. BANION
Roadmaster, Atchison, Topeka & Santa Fe, Independence, Kan.

In ballasting or making a general raise without applying ballast, it is seldom necessary to line track ahead of the surfacing, unless it is to be lined to a new center for a long distance and the average throw is in excess of two inches. Quite frequently in laying rail, curves must be lined ahead of the rail laying and surfacing to secure the proper expansion at the joints, but this is seldom necessary in surfacing or ballasting alone, unless the track is to be lined over for such a distance that the tamping will be disturbed by leaving the track improperly centered over the tamping. The final lining of track should precede the filling in or the final placing of the ballast very closely. This will secure a better finished line, as track

will not stay in line if left for any length of time without ballast to hold it in place. To try to line track after it is full ballasted is a waste of time and unsatisfactory results are secured.

Lines Only After Surfacing is Completed

By W. E. TILLETT

Assistant Foreman, Chesapeake & Ohio, Maysville, Ky.

I can see no particular advantage in lining the track ahead of the surfacing, whether new ballast is being applied or ties are being renewed. In general, I consider this to be a waste of time and effort. The most practical method of handling the lining under the conditions specified in the question is to complete the surfacing for the day in sufficient time to go back over the track and line it before leaving it for the night. By following this practice, every day's work will be completed and there will be no hangover for the following day.

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Long Discharge Lines

Where a long discharge line is being laid in undulating country, what precautions should be observed to avoid excessive pump pressures and insure dependable delivery af water at the tank ?

Study Descending Grades Carefully

By R. L. HOLMES

Engineer Water Supply, Texas & Pacific, Dallas, Tex.

As the initial step, determine the static head between the source of supply and the delivery point. The dynamic head will depend upon the volume of water to be delivered, the size and the length of the pipe line. Knowing the volume of water to be handled per minute, the pipe size is selected which will maintain the most even balance between the cost of power, including fixed charges, maintenance and operation, and the cost of the line, including fixed charges and maintenance. In some cases I have found it advantageous to increase slightly the size of the pipe to reduce working pressures, since this reduces the horse-power consumption and lowers the operating costs by an amount which more than justifies the higher cost of the pipe.

In considering the diameter of the pipe, the velocity and character of the water should also be taken into consideration. If the water is clear, the velocity may be considered only in its relation to friction. If it is a turbid or very muddy water, the velocity should be sufficient to keep the line scoured out. A concrete case illustrating the advantage of this practice presented itself some years ago. In planning a project it was decided to install a 75-hp. pumping unit with a 12-in. line, holding the velocity of the water at 3.4 ft. per sec., rather than to use a 40-hp. unit with a 14-in. line in which the velocity would be only 2.5 ft. per sec. The 12-in. line has been examined several times during its 18 years of service and has been found to be in good condition, while during this time there has been no increase in operating pressure. This result has been obtained despite the fact that at certain times the water has been found to contain as much as six per cent of turbidity by volume.

When laying a pipe line across undulating country, all high points should be provided with automatic air vents of suitable size to remove any accumulation of air which may restrict the sectional area and cause excessive operating pressures or a reduction in the flow.

A careful study should be made of all descending grades, especially those of considerable length, which may allow a reduction in the size of the line without a change in operating pressure. In long lines much may be gained by using variable-speed pumps for both starting and stopping the flow. Such equipment enables the operator to set the water in motion gradually or bring it to rest without excessive surging.

It requires a definite amount of power to elevate a given volume of water to any height. To overcome excessive pressures, it has been found advantageous to divide the head into equal units, making duplicate installations of the pumping equipment, each of which is independent in its operation and automatic if electric power is available. Furthermore, this type of installation permits aeration, which is very desirable with certain waters.

Keep Line Below Hydraulic Gradient

By Engineer of Water Service

Three precautions should always be observed in planning and installing a discharge line in undulating country. First, keep the summits or high points in the line, where air will accumulate, to the lowest practicable minimum, even if necessary to undergo some expense to do so. As a corollary, this will also reduce the number of low spots which act as traps for sediment. Second, automatic air vents should be applied to all high points that cannot be avoided, since any accumulation of air reduces the effective cross section of the pipe. If allowed to accumulate, it will increase progressively the pump pressure necessary to force the normal volume of discharge through the restricted area, and in the end will completely eliminate the flow in the pipe. Likewise, blow-off valves should be placed at the low points, with provision for drainage, of sufficient area when fully open to insure that any accumulation of sediment will be washed out.

Not the least important of these precautions is to establish the hydraulic gradient between the pumps and the point of delivery and then insure that no part of the pipe line lies above this gradient. If it does, the negative pressure in the section above the hydraulic gradient must be overcome by increasing the pressure at the pumps or no water will flow in the pipe. In other words, the pressure at the pumps must be increased by an amount sufficient to lift the hydraulic gradient above the highest point in the section of the line which lies above the original hydraulic gradient.

Air Pockets Reduce Carrying Capacity

By C. R. KNOWLES

Superintendent Water Service, Illinois Central, Chicago

Where long discharge lines are laid in undulating country, air pockets form at the summits under certain conditions, thus reducing the carrying capacity of the pipe line as well as sometimes causing objectionable water hammer. To avoid the formation of the air pockets, it is necessary to provide openings for releasing the air. While ordinary valves are sometimes used for this purpose, an automatic air valve is more desirable. These valves are of various types, a popular design being operated by a float valve. When the air takes the place of the water, the float drops, carrying the valve away from the seat and permitting the air to escape. The rising float causes the valve to close the air vent when the water

enters the valve chamber, thus preventing the escape of water.

Another type consists of a hollow brass ball suspended in a cage within a cylindrical casing. There is sufficient clearance between the cylinder walls and the ball for the escape of air. As the air is exhausted, water enters the cylinder and floats the ball up against the seat. When the air collects or the pipe is empty, the ball drops back, allowing the escape or entrance of air, and the device thus acts as both a pressure and vacuum air valve. In distribution systems, hydrants may sometimes be placed at the summits and used as air valves. Air valves should be protected against frost and should be equipped with shut-off valves to permit necessary repairs to be made without putting the entire line out of service.

Air valves on pipe lines larger than 24 in. in diameter should be of such design that they will admit air and thus prevent the collapse of the pipe if a vacuum forms by reason of quick drainage of the pipe, such as may result from a break or other cause. These valves are particularly necessary on gravity lines, especially with wood stave and steel pipe.

All depressions in pipe lines of any magnitude should be provided with blow-off valves to permit the blowing out of any sediment which may accumulate. These blow-off valves should have a capacity of about one-third of that of the main pipe.

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Joints at Turnouts

What is the minimum allowable distance between switch points and the nearest joints in advance? Why? Does the length of rail or of the switch points make any difference ?

Keep as Far Away as Practicable

By Division Engineer

Obviously it is desirable to keep joints as far from switch points, say up to five or six feet, as is practicable. My experience leads me to believe that it is equally desirable to square the joints immediately ahead of the points, since this permits an arrangement of the rails which does not locate any joints between the point and heel of the switch, a thing that should by all means be avoided. Through this arrangement full angle bars can be used instead of bars with the flange sheared off. Where the rails are 39 ft. long and points up to 30 ft. are used, there is no difficulty in obtaining a spacing of 6 ft. between the points and the joints. Where points 33 ft. long are used, there is only 6 ft. difference in the length of the point and the main rail, so this difference must be divided in order to keep all joints outside of the heel and points of the switch. By doing this, the shearing of the flange of the angle bar is avoided.

Would Establish a Minimum of 6 Ft.

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Anyone with experience in keeping track to surface through turnouts is aware of the difficulties that ensue when a rail gang, in its hurry to lay so much rail in a day, does not take the time or care necessary to locate the joints properly with respect to the switch at the time it is renewing the turnout. The difference between proper care and attention to this item and indifferent or haphazard installations may mean a very definite and surprising difference in the life of some of the parts of the assembly. From my experience in this respect I would establish a minimum of six feet between the points and the nearest joint in advance. I would not permit this to be reduced except by special permission. By adhering to this spacing, the joint ties and those adjacent can be tamped easily without it becoming necessary to move the head blocks at any time. Thus the foundation can be kept more rigid and the rails in better surface.

In general, the length of the switch point is an important factor in locating the joints in question. Where points 16½ ft. to 23 ft. are in use, there is no difficulty in maintaining a spacing of 6 ft. When the points are increased to 30 and 33 ft., trouble is encountered at once, particularly where angle bars 38 in. or longer are in service. I see no reason why the stock rails and main running rails as well cannot be moved ahead far enough to permit the installation of heel blocks. In view of the heavy bars and bolts now in service and the use of heel blocks, the strength of the joint will be affected but little.

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End Tamping of Ties

With what kinds of ballast is it practical to tamp ties from the end by means of a wide thin blade? What are the advantages and disadvantages, as compared with pick or shovel tamping? What are the limitations of this method ?

This Is Not a New Method

By T. F. DONAHOE

Supervisor of Road, Baltimore & Ohio, Pittsburgh, Pa.

Tamping ties from the end is not new, since the use of trowels or end tampers dates back many years. The reduced forces of the last two or three years has brought this method into more general use, however, because it enables a foreman to maintain his tracks in good riding condition with a smaller force than is possible with the shovel, pick or tamping bar. It can be used to good advantage in any soft ballast, such as chatts, granulated and chain slag, locomotive cinders, fine gravel containing 15 to 20 per cent of sand, small stone and coarser stone which contains a considerable amount of the 1-in. and 1½-in. sizes, so that the ballast as a whole is reasonably uniform.

Among the advantages are the rapidity with which the surfacing can be done, the permanence of the tamping, the smaller effort involved, the ability to "tighten" joint ties that are loose but not out of surface, the opening of the drainage at the ends of the ties and the fact that the ballast in the crib is not disturbed as in other methods.

This method is not so easily employed on the inside of double or multiple tracks, particularly where the ballast is filled to the top of the ties, as the digging of the ballast from the ends requires too much time and labor. To use the trowels in coarse ballast it is necessary to hand-pick small stone, placing them on the trowel, or to use screenings that have been placed in convenient piles so that they can be handled by a ballast box or pony car.

It requires considerable time for foremen and men to learn this method so that they are able to do good work and do it rapidly. The level board must always be used, but the amount of raise is determined by eye,

and each tie that is to be tamped should be chalked. One man should follow, digging the ballast from the ends of the ties and tapping down spikes. A second man with a light jack and trowel does the raising and tamping. If there are three men in the gang, the third follows dressing the ballast where it has been disturbed. If four men are available the second and third should attend to the jack and raising, as this is the heaviest part of the work, and the fourth does the dressing.

By this method cross level can be corrected over long stretches. Light raises for one or two rail lengths can also be made, where both rails must be lifted. Care should be used, however, not to give too much lift. It is easier to raise a few spots the second time than it is to dig one down. Where track is quite rough, it is better to work one rail through to the end, then surface the opposite rail.

Finally, one of the important advantages of this method is the fact that the old bed is not disturbed, so that the tie is assured a solid foundation.

Has Not Used Tamping Pick in More Than a Year

By J. J. DESMOND
Division Engineer, Illinois Central, Chicago

We are following this practice extensively. In fact, on certain districts we have not used a pick or tamping bar in more than a year. It is our experience that after the foremen and men become accustomed to the proper loading of the trowels the work becomes easy and is quickly done. It is essential to have the right kind of ballast to place on the trowel, as even one piece of gravel that is too large may cause bunching and uneven distribution as the blade is pulled out. The result of this situation will be an uneven surface and in aggravated cases it is even possible to cause broken ties. In any event, the method will be a complete failure unless an even bed of ballast is placed under the tie for the proper distance from the end.

One rail should be raised and several trains allowed to pass over it before the other is disturbed. The level board must always be used for raising the second rail, although it is usually lifted slightly higher than level to allow for settlement.

On ordinary work two men can accomplish more, leaving the track in as good if not better riding condition than eight men can by hand tamping with picks or bars. A particular advantage is that neither the bed under the tie nor the ballast in the crib needs to be disturbed. The removal of the ballast from the end of the ties also tends to improve drainage.

We have surfaced track by this method in chatts, washed gravel and stone. It is particularly adapted for use in the first two types. We have used it to a limited extent in cinders and other fine materials with equally satisfactory results.

Ballast Should Always Be Dry

By ROBERT WHITE
Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

Tamping ties from the ends is a practical method of surfacing track. The best results are obtained with the finer materials, such as chatts or gravel in which the stones are of uniform size, well bound with sand, but not large. If the ballast consists of rock, washed gravel or other coarse material, it is necessary to have some finer materials available with which to do the "shooting." Whatever the type of ballast, however, it should always be dry if best results are desired. This method cannot be used to advantage around turnouts or where the raise exceeds 1½ in. There seems to be a disadvantage in its use on curves, as it is difficult to keep them in line when the ties are tamped from the end, probably caused in part by the loosening of the ballast at the ends of the ties.

This method of tamping is accomplished by using a thin blade 5 to 6 in. wide and 30 to 34 in. long. The tie is raised slightly above the final surface. The blade, which is covered evenly with ballast, is inserted and quickly withdrawn. The extra lift is made to allow for the thickness of the blade and the settlement which will inevitably occur with the loosely placed ballast.

Among the advantages of this method is the better drainage that results. A further important advantage is the fact that a foreman and two men can on the average surface a quarter of a mile of track a day and have enough time to line it with track lines.

In general, the foreman should test the track with the level, marking all low spots. The men remove the ballast from the ends of the ties at the places marked. When several rail lengths have been prepared in this manner, the raising is started. The jackman holds the tie up tight to the rail, while the foreman "shoots" the tie. The second man does the dressing.

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Cleaning Bridge Seats

Should bridge seats be kept clear of dirt and cinders? Why? If so, who should be required to do this ?

Dirt Interferes With Inspection

By I. ANDERSON
Division Engineer, Atchison, Topeka & Santa Fe, Chanute, Kan.

It is fundamental, in the construction and maintenance of any physical structure, that it should be kept in neat and tidy condition. This lends interest in the work to those who do the work and are responsible for it. Bridge seats should always be kept clear of any debris which may come to them. If they are not clean, this will interfere with and may prevent a proper inspection of the condition of the masonry. If the debris is allowed to accumulate around the shoes of the steelwork it causes undue deterioration of the paint and rusting of the steel. If this cleaning is neglected there will shortly be an accumulation of debris that will interfere with slide or rocker bearings. Any such accumulation will hold moisture, with its usual deleterious effects, especially during freezing and thawing weather.

Every gang that works on a bridge should be required to leave its work in a neat and tidy condition, but the section forces should be held responsible for any subsequent cleaning that is required around the bridge.

Section Forces Should Do Cleaning

By PAUL D. COOK
Bridge Inspector, Southern Pacific, El Paso, Tex.

Where dirt accumulates on a bridge seat, it is certain to pile up around the bridge shoes, damaging the paint and shortly starting corrosion. If this condition is allowed to continue, the rust will eat into the steel of the shoes or of the expansion assembly until these members fail by fracture, or they cease to function properly to

provide for expansion or contraction. If the latter, undue stresses may be induced in other members and in extreme cases cause their failure.

Besides damaging the steel, the practice of allowing dirt to accumulate on the bridge seat will cause damage to the abutments and piers. If they are of wood, the entrapped water or moisture will accelerate decay. If they are of concrete or stone masonry they will not be able to drain properly, which will hasten the effect of weathering, and their eventual failure.

Another bad feature of this practice is that proper inspection cannot be made. If the shoes or other members are covered with dirt the inspector is compelled to guess at what is going on under the debris.

I favor having the section forces keep the bridge seats clean, because they are always in the vicinity, they see the structures oftener than any other employees and they can do the cleaning whenever it is needed without the expense entailed in sending men from distant points to do the work.

Dirt on Bridge Seats Is Harmful

By C. A. WHIPPLE
District Engineer, Chesapeake & Ohio, Columbus, Ohio

Dust and cinders around pedestals and bearing plates are harmful to the metal with which they come into contact, to the extent that they retain moisture, so that the destructive action of acid and corrosion are accelerated. The cost of removing such accumulations is small, being no more than that required for three or four sweepings of flat surfaces annually, but including a thorough cleaning after the unloading of ballast or of bank-widening material on adjacent tracks. The expense of cleaning is amply justified as insurance against deterioration of important metal parts.

To insure that it will be handled as a matter of routine, such work should be the responsibility of the section foreman, who is in a position to insure timely and thorough performance. The work should be done by the track walker, or other agency that is employed for small miscellaneous items of work on the section. In territory where grade or other conditions cause frequent use of sand by locomotives, or where the structures are long or frequent, full or part time cleaners may sometimes be assigned to advantage. These men should be drawn from the bridge and building forces, especially where portable air compressors or permanent air-cleaning devices are employed to reduce the labor factor.

Bridge Seats Should Be Kept Clean

By C. P. SCHANTZ
Assistant Engineer of Bridges, Pennsylvania, Philadelphia, Pa.

Bridge seats should be kept clean for the proper maintenance of the bridges, which are the most costly and important of roadway structures. Collections of cinders, leaves, birds' nests and other combustible materials constitute a positive fire hazard to open wood-deck structures. Neglected accumulations of roadway dirt and ballast retain moisture and absorb brine drippings around the bottoms of end-stiffener angles, bearing plates, rocker and roller castings or important lower chords and connections on trusses. One of the primary requirements of low cost, depreciation-reducing maintenance is proper drainage and absence of entrapped moisture. Complete drainage is deemed of sufficient importance to warrant considerable expenditure to provide both open and piped drains on abutments and bridge seats. Deliberately allowing abutment drainage to clog at street or highway under-grade structures forces the water to flow over the face of the abutments to the sidewalks, causes undesirable sidewalk conditions and frequently hastens the deterioration of the abutments themselves.

Retention of moisture on the bridge seat by accumulated dirt shortens the life of the bridge seat through frost and acid action. Frozen expansion bearings can seldom be avoided unless the bridge seats are kept clean.

Since the master carpenter is usually responsible for the regular monthly bridge inspection, and since a full inspection is impossible unless the bridge seats are clean, it is reasonable to make him responsible for keeping them clear, although they may be dirtied by other than his own forces. His men are equipped by experience in the climbing that is necessary while his own inspector cannot certify to the correctness of his reports on the condition of bearings and other parts he cannot see.

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Retarding Decay Below Floors

What methods other than the use of treated lumber can be employed to minimize decay below the floor level in frame buildings ?

Nothing So Effective as Treated Timber

By G. A. BELDEN
Architect, Central of Georgia, Savannah, Ga.

In considering this subject it is desirable to emphasize the fact that the methods and precautions to be discussed are only measures for minimizing or retarding decay and it is not intended in any way to convey the thought that such measures are positive or as effective as the use of a suitable wood preservative in prolonging the life of the timbers of a building below the floor level.

Decay in wood is a biological process which results from the activities of certain low forms of plant life called fungi. These fungi feed on the sap and eventually bring about a complete breaking down of the cell walls. For this growth four conditions are necessary: (1) An adequate food supply; (2) sufficient moisture; (3) a suitable temperature; and (4) an adequate supply of air. It is only through the control of these factors that the process of decay can be regulated, but no amount of control will completely arrest it.

Unseasoned sapwood provides an abundant supply of food in readily assimilated form. Even in those woods in which the heartwood is immune from attack, the sapwood offers little resistance to fungi, so that it is essential to use only the heartwood of species of known resistance for those parts of a structure that are favorably located for the growth of fungi. Among the species in which the heartwood is most resistant to decay are dense southern yellow pine, tidewater cypress, dense Douglas fir, red cedar and redwood. These woods contain toxic oils which, if not actually poisonous to the fungi, at least make them unattractive as a source of food.

Moisture being essential to fungus growth, those parts of a building below the floor line should be kept permanently dry. The wood should be so placed that it cannot get moisture from the damp ground, damp masonry, or from sweating or leaking pipes. Moisture from the air is precipitated on colder surfaces. This indicates the necessity for adequate ventilation to equal-

ize the temperature of the air and of the wood in the under-floor members. A free flow of air also tends to evaporate any moisture that may be in or on the wood and from the ground under the building. Adequate ventilation is, therefore, one of the essentials for retarding decay.

Green lumber is extremely susceptible to infection, so that only thoroughly sound air-seasoned or kiln-dried material should be used. If infected rough lumber is passed through a planer, the fungi on the surface are removed and the wood may present a bright surface that is easily mistaken for sound wood, until drying brings out the brown spots that are indicative of rotten wood. It is important, therefore, that all wood be inspected for incipient decay.

Painting of sound dry lumber is beneficial to preventing decay in proportion to its waterproofing value. Aluminum paint has proved to be very satisfactory in this respect in some localities.

For practical purposes, the following rules summarize the requisites for minimizing the decay of untreated lumber below the floor level in frame buildings:

1. Use only well seasoned heart timber from those species which are known to resist decay.
2. Inspect lumber carefully at delivery to guard against material that is already infected.
3. Avoid placing the lumber in contact with the earth, damp masonry or pipes that may leak or sweat.
4. Provide adequate drainage to insure that the soil under the building will be dry.
5. Keep the building as high as practicable above the ground and provide the maximum practicable amount of ventilation.
6. If practicable, paint the lumber below the floor line with a damp-resisting paint before erection, and be sure that the wood is dry before it is painted.

Termites More Important than Decay

By A. L. BECKER
Architect, Missouri Pacific Lines, Houston, Tex.

Since our lines are located in a strictly yellow pine country we are compelled, for economic reasons, to make use of this material. It is common knowledge that there are several species of yellow pine, some of which are more resistant to decay than others. We are confronted with insects, however, particularly termites, which make it imperative that we use creosoted timber, particularly for under floor members.

Long-leaf yellow pine having 90 per cent heartwood resists decay quite successfully, but costs much more than other grades, while it does not offer any greater resistance to attacks by insects. In ordinary building construction, No. 1 common long-leaf yellow pine serves all practical purposes. When treated with 10 lb. of creosote by the full-cell process, it provides protection against decay as well as against termites, and does this without bringing the total cost above that of the 90-per cent heartwood long-leaf yellow pine which cannot be treated successfully.

Since creosoted material must be air seasoned before treatment, which requires considerable time, depending on the season of the year, it is necessary to carry a considerable stock on hand. In order to keep this stock to a minimum our buildings are designed with a view to reducing the number of stock sizes required.

Where this necessity for using creosoted material does not exist, decay can be materially retarded if the substructure is properly ventilated and the ground graded to provide satisfactory drainage.

Modernizing Water Service

(Continued from page 330)

ment, the needed facilities have been obtained by the addition of power units and pumps of more modern design.

On certain districts the waters are very hard, and early efforts were made to improve them. In 1913, six treating plants were in operation. In the intervening years these plants have been rebuilt and the treating facilities extended to include all main-line stations between Clinton, Ill., and Freeport and the lines west of Freeport, while additional plants have been built at a number of hard-water stations elsewhere. Subsequent changes in the source of supply, as at Carbondale, have caused the abandonment of a few plants, but at present 34 lime-soda ash plants for pre-treatment of the water are in operation, representing an investment of $740,000. Since 1926, an average of more than 2,000,000,000 gal. of water has been treated annually by this method, and since 1920 more than 45,000,000 lb. of solids have been removed from the water, representing annual net savings of $409,000.

Recently, after extensive tests, interior treatment is being applied to all locomotive waters on three divisions. Some of the waters so treated contain as little as 0.5 gr. of scale-forming solids to the gallon while a number of others do not exceed 1 and 1.1 gr. These waters are highly corrosive, however, and are being treated for the correction of this condition. The amount of incrusting solids in the remaining water treated by this method range up to 35 gr. per gal., some of them also being highly corrosive.

Wayside equipment for introducing the chemicals to insure correct proportioning for each water have been installed on these divisions. Interior treatment is also used to a limited extent elsewhere, a total of 1,000,000,000 gal. a year being treated in this manner. The main objective with such waters is to correct their corrosive action on boilers.

While reliability of service has always been uppermost, the economies that can be obtained from proper planning and construction have not been overlooked. Pump houses have, therefore, been designed for permanence, tank spouts have been abolished except on unimportant branches and water columns substituted, while pipe lines and other equipment have been designed with a margin for increased demand. As a result of applying this practice consistently to all construction and design, the aggregate cost of water station maintenance was reduced from $106,000 in 1913 to $93,000 in 1932, in the face of the fact that the number of water stations has increased from 300 to 353 during the period, that with only a few minor exceptions the capacity of the individual plants has been greatly increased, that the total amount of water consumed has more than doubled, that 34 treating plants are now in operation as compared with 6 in 1913, and that there have been marked advances in wages and the cost of materials.

While changes in traffic conditions and the necessity for constant attention to modernization to meet increasing demands on the plants or to obtain greater economy have absorbed much of the energy of the water service department, it has also been alert to the necessity for economies in other directions. As an illustration, the Illinois Central has been a pioneer in water-waste prevention, through which activity it has already effected savings of more than $1,000,000, while these savings are still accumulating at the rate of $100,000 a year.

New and Improved Devices

Fully Automatic Zeolite Water Softener

TO INCREASE the efficiency and economy of operation of zeolite water softening, the Permutit Company, New York, has developed a fully automatic zeolite water softener, which is completely self-regenerating and requires merely the occasional replenishing of the salt supply in the storage tank. The heart of the new softener is a motor-operated, multiple position valve, which is controlled by a water meter, a time switch and a float switch.

The automatic softener has all of the advantages of the manually-operated softener, with the added advantages of efficiency and economy. The new softener is claimed to insure precise control and completely softened water, with no over-running and no under-regeneration. It is said also that the thorough washing provided in the new softener assures clean active zeolite; that the unit uses the absolute minimum of salt required for regeneration; and that thorough rinsing is brought about with a minimum quantity of water. The new automatic softener costs no more than the manually-operated type, and if desired, the automatic features can be applied to any existing downflow zeolite softener.

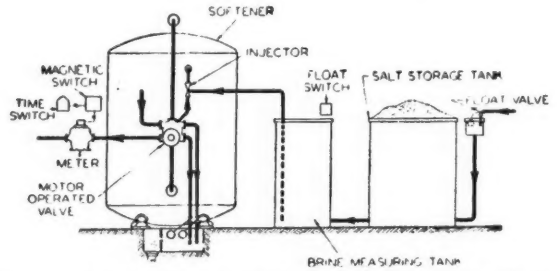


Diagram of Major Features Involved in the New Automatically-Operated Zeolite Plant

The motor-operated valve is the key of the automatic system provided. After a specific number of gallons of water have passed through the water meter in the normal water softening process, electrical contacts in the meter head actuate the valve motor, which, in turn, rotates the valve to backwash position, reversing the flow of water through the zeolite bed so that it is upward instead of downward. The upward flow of the water cleanses the zeolite and flushes off to the sewer all impurities which have been retained on the surface of the bed.

This operation continues for a specific number of minutes and is then brought to a conclusion by the time switch, which causes the motor-operated valve to rotate to its next position, that of brining. In the brine system there is a brine-measuring tank, containing the exact amount of saturated salt solution for one dose or regeneration, which has a direct connection into the top of the softener and also with a large salt storage tank which is kept filled automatically with water to form the brine solution supply.

When the motor-operated valve reaches the brining position, the brine from the measuring tank is quickly sucked into the top of the softener through the action of a hydraulic injector. When the level in the measuring tank falls to a pre-determined level, a float switch causes the motor-operated valve to come into play again, this time cutting off the flow of brine and moving to a position for rinsing the bed. At this same time, a new charge of brine is admitted automatically to the brine measuring tank, and through a float valve, a corresponding amount of fresh water is admitted to the salt storage tank to replenish the brine supply.

During the rinsing operation, the time switch is in control and, after a predetermined interval of time, again actuates the valve motor, causing the valve to shut off the rinse water and to assume its original position for normal water softening. During this complete cycle of operation, the valve turns through 360 deg.

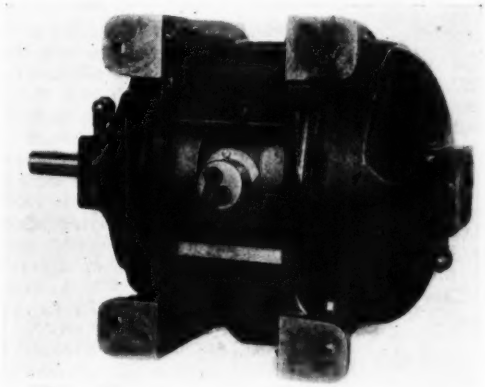
New Westinghouse Motors Are Self-Protecting

TO AFFORD adequate protection against overheating in electric motors, from whatever cause, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed what it terms "Thermoguard" motors—motors which have a built-in disc thermostat that functions before the temperature of the motor insulation reaches the danger point. Combined with a control device with a separate thermal overload relay, it is said that the new combination meets all requirements for protection against motor "burnouts" and offers a degree of insurance against production losses and maintenance expenses heretofore unattainable.

Thermoguard motors include those of the induction, direct-current and synchronous types, in a wide range of capacities, and are highly adapted to such services as driving water service pumps, machine tools, fans, blowers, compressors, etc., and for heavy-duty applications, such as on cranes, hoists, shovels, turntables, transfer tables, lift bridges and conveyors. It is said that whereas fuses and instantaneous circuit breakers afford protection to motors only against the damage caused by overloads, and the later development—the thermal type overload relay, used with a starter—protects motors only against overheating due to failure to start, a stalled condition and continuous overloads, the Thermoguard self-protecting motors, with the special control furnished,

provide, in addition, protection against damage due to frequently repeated overloads, variable room temperatures, failure of ventilation and abnormal starting conditions.

Thermoguard motors may be arranged, at the option of the user, either to be disconnected from the source of power when the temperature approaches the danger zone, or to indicate, by giving an audible or visible signal, when



A Thermoguard Self-Protecting A. C. Induction Motor—The Thermostat is Located Inside the Cap Shown, Which is Bolted to the Stator Laminations on the Bottom of the Motor

an unsafe temperature is being approached. In services where an enforced motor-shut-down would cause a loss of product or other hazard, the Thermoguard motor will give advance warning that an emergency exists, so that corrective measures can be taken. When desirable, the motors can be arranged to stop when their temperature is dangerously high, and to remain shut off until the operator manipulates the control. On the other hand, it is possible to arrange the control so that the motor will restart automatically when it has cooled to a safe operating temperature, which is particularly advantageous in connection with unattended operations.

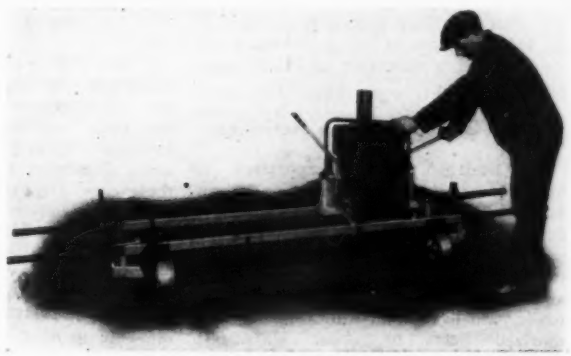
New Rail Joint Cross Grinder

THE Railway Track-Work Company, Philadelphia, Pa., has developed a light, portable gasoline-engine operated grinding machine, designated Model P-11, which is designed for the cross slotting or bevelling of rail ends at joints in the track, either with or without reference to the repair of the ends by welding. The new machine consists essentially of a flanged wheel carriage frame, which operates on the track, on which is mounted a movable carriage carrying the engine unit and grinding equipment. The motor-grinder carriage is designed to be pushed transversely back and forth across the frame to permit grinding on both lines of rails, and for this purpose is mounted on ball bearings which run on steel guides.

The driving engine is a four-horsepower, air-cooled unit, weighing only 100 lbs., which has connection with the grinders beneath through V-belts and steel shafts. Two grinder heads are provided, one toward each side of the carriage, with the grinding wheels mounted at right angles to the rails, thus permitting grinding on both rails with a minimum of movement of the carriage and without the necessity for turning the machine around. A separate hand lever controls the grinding operations of each wheel, the lever in each case having connection with the arbor housing of the wheel, controlled through a cylinder containing a plunger and suitable coil springs. Through this arrangement, slight pressure downward on the operating lever, against the spring action, feeds the wheel into the work, while release of this pressure causes the grinding wheel to rise upward quickly away from the work. Thus, the joints can be ground or slotted to any depth desired and the machine quickly released for movement along the track.

A pivoted bracket device with a ratchet clamp is provided at each end of the carriage frame, whereby the flanges of the track wheels can be drawn up tight against the gage side of the rail being worked on, thus insuring accurate alinement of the machine and securing it against any movement while grinding is under way. A joint indicator is provided on the bottom of each bracket, which enables the operator to spot the machine accurately so that the grinding wheels will make cuts truly at the points desired.

In bevelling rail ends, any depth or width of cut and any angle of bevel can be obtained by using the proper



The Model P-11 Cross Grinder in Operation

bevel cutting grinding wheels, or, if slotting of the joints or removing overflowed metal from the rail ends alone is desired, without bevelling, a straight grinding wheel, 8 in. in diameter by 1/8 or 3/8 in. thick, can be used. If time permits, as when the grinder is used with a small welding gang, 8-in. by 1-in. wheels can be readily applied to the grinders and employed to grind out any fractured metal at the joints prior to welding to afford clean, sound metal to work on. Later, the slotting wheels can be replaced and the slotting work brought up with the grinding.

The frame of the grinder is of steel and has seamless steel tube extension lifting handles on each end which can be folded upright when this may be desirable. The track wheels are of aluminum alloy and are all insulated to avoid operating the signals. The machine has an over-all width of 34 in., an over-all height of 36 in., an over-all length, with the handles extended, of 116 in., and weighs, complete, 380 lbs. The Model P-11 grinder can be furnished equipped with an electric motor drive.

NOTES ON THE FAIR—A total of 366,139 persons have passed through the trains exhibited at A Century of Progress Exposition by the Baltimore & Ohio, the Chicago, Burlington & Quincy and the London, Midland and Scottish from May 27 to June 24, an average of 13,075 persons per day. During the week ending June 24, 107,345 persons inspected the trains. The Mississippi, a wood-burning locomotive built in 1833 for service on the Mississippi Railroad, now a part of the Illinois Central, has been brought to Chicago for exhibition at the Fair from Brookhaven, Mass.

News of the Month . . .

Production of Track Fastenings Lower in 1932

The production of rail joints and fastenings in 1932, including angle bars, fish plates, other rail joints and tie plates totaled 143,553 gross tons as compared with 369,831 gross tons for 1931, a reduction of 226,278 tons, or 61 per cent. The production of angle bars last year was 28,155 gross tons against 100,959 tons in 1931, a drop of 72,804 tons or 72 per cent. Tie plates declined from a production of 252,445 gross tons in 1931 to 109,666 gross tons in 1932, a reduction of 142,779 tons, or 57 per cent.

R. C. C. Ends Loaning Activities

The Railroad Credit Corporation on May 26 terminated administration of the loan pool derived from the freight rate surcharges that went into effect on January 2, 1932. On the closing date of its loaning activities, the corporation authorized loans of $7,500,000 to nine railroads, which brought the total of authorized loans to about $73,000,000. Henceforth the corporation will act as a liquidating agency to repay to the railroads, as collected from borrowing roads, the amounts they contributed to the loan pool from the surcharge activities.

New Haven Wins Harriman Safety Award

The New York, New Haven & Hartford, represented by President J. J. Pelley, was awarded the Harriman Memorial gold medal for the year 1932 at a meeting of the American Museum of Safety at New York on June 14. This medal is awarded for the best safety record of Class I railroads operating more than 10,000,000 locomotive-miles during the year. A silver medal was awarded to the Atlantic City Railroad and a bronze medal to the Texas-Mexican, the former being the winner among the Class I railroads operating between 1,000,000 and 10,000,000 locomotive-miles per year, while the latter road took first place in the group operating less than 1,000,000 locomotive-miles per year.

Four Months Net Close to Last Year

In April the net railway operating income of the Class I railroads was only slightly under that for the same month in 1932. Net income was $19,041,789 in April, 1933, which was at the annual rate of return of 1.10 per cent on the railroads' investment, and $20,273,161, or 1.17 per cent, in the corresponding month of last year. Operating revenues for April amounted to $224,877,399, as compared with $264,885,723 in April, 1932, a decrease of 15.1 per cent. For the first four months of 1933 these railroads had a net income of $52,761,317, or 0.78 per cent, as compared with a net of $85,647,469, or 1.26 per cent, in the same period of 1932. Operating revenues for this period were $881,689,125 in 1933, and $1,087,903,768 in 1932, a decrease of 19.0 per cent.

All-Aluminum Passenger Cars Developed by Pullman

A new step in the evolution of railway passenger equipment is represented in two all-aluminum Pullman cars which are being exhibited at A Century of Progress Exposition at Chicago. By using aluminum in the construction of these cars, a saving of approximately 50 per cent in passenger car weight is made without the sacrifice of essential strength or carrying capacity. The larger of the cars is an 84-ft. observation-room car intended for operation in regular main-line passenger train service, while the other is a 79-ft. observation coach designed for main-line service and particularly adapted, because of its light weight, to use as a motor-train trailer. These cars, which are of striking beauty inside and out, are completely appointed and are equipped with air-conditioning systems that are especially constructed to exclude dirt and dampen noise and vibration at all speeds. They are also provided with modified stream line observation ends to reduce air resistance.

Eastman Named Rail Co-ordinator

Commissioner Joseph B. Eastman of the Interstate Commerce Commission has been appointed federal co-ordinator of transportation by President Roosevelt under the provisions of the Emergency Railroad Transportation Act of 1933, which was passed by both the Senate and the House of Representatives on June 9. In addition to providing for the appointment of a railroad co-ordinator to co-operate with the railroads in effecting economies through three regional co-ordinating committees, the bill contains the following general features: A method for forcing financial reorganization of railroads requiring loans from the Reconstruction Finance Corporation; provision for an immediate study by the co-ordinator of means for improving transportation and labor conditions; repeal of the fair-return rule, of which the recapture clause was a part; substitution of a "flexible" rule of rate-making naming general factors to be considered by the Interstate Commerce Commission in prescribing rates; extension of the jurisdiction of the commission over all forms of acquisition and control of railroads; and regulation of the accounts and capitalization of holding companies that may be authorized to acquire control of railroads.

Salaries of Railway Officers Reduced Further

Further sharp reductions in the salaries of railway officers were made in the year ended March 1, 1933, in addition to general reductions made before that time, according to a compilation made by the Interstate Commerce Commission. Only 47 Class I railroads were paying salaries of $25,000 and over to their highest officers on March 1, 1933, while in 1929 there were 61 Class I roads paying salaries of $25,000 or more. Officers receiving salaries of $50,000 or more a year numbered 31 on March 1, 1933, as compared with 39 on March 1, 1932. The number receiving $10,000 or more was 775, compared with 958 in 1932. Only two officers were receiving $100,000 or more a year on March 1 of this year, as compared with four in 1932.

World's Fair Boosts Railway Passenger Travel

Heavy increases in the number of passengers carried into Chicago are being reported by all railroads entering that city since A Century of Progress Exposition opened its gates on May 27. While the exposition is the main objective of travelers, the increase in travel is also encouraged by the low railroad rates in effect and a general improvement in business. The heaviest movement of passengers occurred on June 17 and 18. The New York Central on June 18 carried 3,897 visitors to Chicago, while the Pennsylvania operated 13 of its trains in 30 sections into the city on June 17 and 18. The Baltimore & Ohio operated the Capitol Limited in two sections into Chicago on June 4 and 5, three sections on June 11, two sections on June 13 and 15, three sections on June 18 and four sections on June 25. Other railroads operating into Chicago on which heavy increases of passenger traffic have been reported are the Atchison, Topeka & Santa Fe, the Chicago & North Western, the Chicago, Milwaukee, St. Paul & Pacific and the Illinois Central.

Paul Shoup Expresses Confidence in Future of Railroads

Firm confidence in the future of the railways of the United States was expressed by Paul Shoup, vice-chairman of the Southern Pacific, in an address which he delivered at Chicago on June 8. "The railroads are coming back—in fact, they never went," said Mr. Shoup. "There seems to have been considerable misapprehension on that point. The future of the railroads is not to be measured by the depression, severe as it has been upon them, any more than is the future of any other great American enterprise. The shrinkage of the business of the country

in the spring of 1933, as compared with the volume four years ago, demonstrates that the traffic of the railroads has run parallel with our business generally, and we may, therefore, reasonably assume, as shown in April and May, that the traffic of the railroads will run parallel with the business of the country in its expansion as well."

R. F. C. Imposes Limitation on Railroad Salaries

The Reconstruction Finance Corporation has announced that in the future its policy will be to impose salary-limitation conditions on all loans to railroads or other corporations paying "excessive" salaries. The first loan affected by this ruling was one of $23,200,000 to the Southern Pacific on May 25, authorization of which was based on the stipulation that the railroad must reduce salaries according to a schedule set up by the R. F. C. This provided for reductions ranging from 60 per cent for salaries that have heretofore been more than $100,000 per year to 10 per cent for salaries and wages ranging from $4,800 to $10,000. The announcement of the R. F. C. said that "these are the maximum salaries that can be paid by the borrowing corporation during the continuance of the loan, or until the road is earning all fixed charges." A report of the Interstate Commerce Commission last year indicated that in 1929, Hale Holden, chairman of the Southern Pacific, received a salary of $150,000, although this had been reduced to $135,000 by March 1, 1932. The condition imposed by the corporation would reduce this to $60,000.

Carroll Miller Replaces Lewis as Member of I. C. C.

The appointment of Carroll Miller of Pittsburgh, Pa., as a member of the Interstate Commerce Commission was sent to the Senate on June 3 by President Roosevelt and was confirmed without opposition by that body on June 9. Mr. Miller succeeds E. I. Lewis, whose term expired on December 31, and who is now director of the Bureau of Valuation of the commission. Mr. Miller was graduated from Stevens Institute of Technology in 1896 and then served successively with the Illinois Steel Company, Chicago; erecting engineer with Humphreys & Glasgow, London, England; and in the operating department of the United Gas Improvement Company. From 1901 to 1907 he served as a consulting engineer with George O. Knapp, at Chicago, and for the next two years he was a consulting engineer at Pittsburgh. From 1909 to 1914 he was chief engineer of the Providence Gas Company; from 1914 to 1918 general manager of the Western United Gas & Electric Company, Aurora, Ill.; from 1918 to 1919, general manager, Philadelphia Company, Pittsburgh; 1919 to 1921, vice-president, Guffy Gillespie Oil Company. Since 1921 he has been vice-president and later president of the Thermatomic Corporation and the Thermatomic Carbon Company, at Pittsburgh, and has been engaged in consulting work.

Association News

The Roadmasters Association

Members of the Executive Committee are now being canvassed relative to a meeting which is proposed to be held in Chicago the latter part of July to pass upon the advisability of holding a convention this year, and to take such other steps as may be necessary to maintain the activities of the association.

Bridge and Building Association

In place of a convention this year, the Bridge and Building Association plans to hold an informal meeting at Chicago on August 29, for the benefit of members who will be attending the World's Fair at that time. A decision as to the exact location of the meeting has not as yet been made. A meeting of the executive committee will also be held at Chicago on the same date.

The Wood-Preservers' Association

Members of the Executive Committee met in Chicago on June 27 to complete the work of organizing committees and to initiate tentative arrangements for the convention at Houston next January. The committee also considered suggestions from members that the association represent the wood preserving industry in organizing under the recently enacted Federal Industrial Recovery Act and decided that since this is a commercial rather than a technical activity the association was not in a position to comply with these suggestions.

Metropolitan Track Supervisors' Club

The annual business meeting of the Metropolitan Track Supervisors' Club was held on June 17 at Keen's Chop House, New York, with about 50 members and guests in attendance. After a special dinner served at 6 p. m., the following officers were elected for the ensuing year: T. E. MacMannis, supervisor of track, Central Railroad of New Jersey, president; M. C. Martin, supervisor of track, New York, New Haven & Hartford, first vice-president; E. E. Crowley, roadmaster, Delaware & Hudson, second vice-president; W. E. Gadd, the Rail Joint Company, secretary-treasurer; members of the executive committee: W. O. Dennis, inspector, Lehigh & New England, the retiring president; W. H. Haggerty, supervisor, New York, New Haven & Hartford; I. D. Talmadge, roadmaster, New York, Ontario & Western; and N. D. Howard, eastern editor, *Railway Engineering and Maintenance*.

American Railway Engineering Association

A letter ballot has been sent to the members of the association requesting approval of the adoption of a 112.4-lb. R. E. rail section developed by the Committee on Rail to replace the present standard 110-lb. R. E. section. This unusual action on the part of the association follows the adoption, at the last convention, of the new 131-lb. R. E. section replacing the former standard 130-lb. R. E. section, with the idea that these two sections will be the only association standards weighing in excess of 100 lb. Prompt action is desired so that the two sections may be submitted to the A. R. A. for approval and thereby encourage their use for orders placed during the present season. The letter ballot was accompanied by tables of comparative properties that bring out the superiority of the proposed 112-lb. standard.

In addition to the Board of Direction, which held a meeting at Cincinnati on June 1, nine committees held meetings during the month. The Committee on Buildings met at Buffalo on June 6 and 7, and the Committee on Economics of Railway Operation at Cincinnati on June 23, while the following committees met at Chicago; Water Service on June 15 and 16; Rail, June 15; Waterproofing, June 16 and 17; Shops and Locomotive Terminals, June 22; Masonry, June 23 and 24; Grade Crossings, June 26; and Wooden Bridges and Trestles on June 30. The Committee on Yards and Terminals will meet at Cincinnati on July 10, and the Special Committee on Stresses in Track at Chicago on July 12.

Katy Has Two Record Excursions

More than 1,200 Texas school children were carried on two excursions operated by the Missouri-Kansas-Texas to Austin as a means of enabling the boys and girls to see their State Capitol, inspect the university and visit state officers. One special ran from Fort Worth, 199 miles, on June 3, and another from Dallas, 210 miles, on May 20, which also carried children from Denison, Bells, Whitewright, Greenville, Royse City, Rockwall, Garland, Waxahachie and Highland Park. The main feature of these educational tours was the fact that many children were accompanied only by a few teachers.

A Drawing of a Three-Car Articulated Streamlined Train of Aluminum Alloys That Is Now Being Constructed for the Union Pacific by the Pullman Car & Manufacturing Co. This Train, Which Will Be Tubular in Shape, Is Designed to Attain a Speed of 110 Miles an Hour, With a Cruising Speed of 90 Miles an Hour.

Personal Mention

General

W. W. James, valuation engineer of the Central of New Jersey, with headquarters at Jersey City, N. J., has been appointed also real estate and tax agent.

C. S. Gzowski, chief engineer of construction of the Canadian National, with headquarters at Montreal, Que., has been appointed also acting manager of the industrial and natural resources department.

P. S. Lewis, assistant to the vice-president in charge of operation and maintenance of the Reading, who was formerly connected with the engineering department of this company, has been appointed general superintendent, with headquarters at Reading, Pa.

W. A. Mather, general superintendent of the Alberta district of the Canadian Pacific, with headquarters at Calgary, Alta., who was formerly connected with the engineering department of this company, has been promoted to assistant to the vice-president, with headquarters at Montreal, Que. Mr. Mather was born on September 12, 1885, at Oshawa, Ont., and was educated at McGill University, graduating in 1908. He entered the service of the Canadian Pacific in May, 1903, and served in the construction department as an axeman, chainman, rodman, instrumentman and transitman, subsequently being promoted to resident engineer on construction with headquarters at Winnipeg, Man. In March, 1912, Mr. Mather was transferred to the operating department as superintendent of the Kenora division, being transferred to Medicine Hat, Alta., in January, 1915. In June of the same year he was promoted to assistant general superintendent of the British Columbia district and in October, 1918, he was further advanced to general superintendent of the Saskatchewan district. On December 1, 1932, he was transferred to the Alberta district, with headquarters at Calgary, where he was located at the time of his recent promotion to assistant to the vice-president.

Engineering

J. W. Pfau, assistant chief engineer of the New York Central Lines, Buffalo and East, has been appointed acting chief engineer with headquarters at New York as before, succeeding **F. B. Freeman** who has been furloughed on account of ill health.

Silas B. Wass, terminal engineer, Montreal terminals development of the Canadian National, with jurisdiction over that portion of the development outside of the central station area, has been appointed division engineer of the St. Thomas division, Central region of the Canadian National, and also division engineer of the Buffalo division of the Wabash, with headquarters at St. Thomas, Ont. Mr. Wass succeeds **W. E. Mellor,** who has been appointed assistant engineer on the two divisions, with headquarters, as before, at St. Thomas.

F. J. Bishop, engineer of bridges, buildings and signals of the Toledo Terminal, Toledo, Ohio, has been appointed engineer maintenance of way to succeed **Ray Stephens,** who has been assigned to other duties. The position of engineer bridges, buildings and signals has been abolished.

C. Miles Burpee, purchasing engineer of the Delaware & Hudson, has been appointed to the newly-created position of research engineer, with headquarters as before at Albany, N. Y., this position including the former duties of purchasing engineer and tie and lumber agent. Mr. Burpee's appointment was made following the death of **A. C. Holley,** tie and lumber agent, which is noted elsewhere in these columns.

Following a consolidation of divisions on the Michigan Central, in which the Northern division, with the exception of the Rives Jct.-Bay City branch, was merged with the Detroit division, and the Middle division and the Rives Jct.-Bay City branch were consolidated to form the Michigan division, a number of changes among division engineers have been made. **John Evans** remains as division engineer of the enlarged Detroit division, with headquarters as before at Detroit. **W. O. Houston,** division engineer of the Middle division, has been appointed to the same position on the new Michigan division, with headquarters as before at Jackson, Mich. **S. D. Williams, Jr.,** division engineer of the Northern division, with headquarters at Bay City, Mich., has been appointed to the newly-created position of engineer of track, with headquarters at Detroit. **E. R. Lewis,** principal assistant engineer, has been appointed office engineer with headquarters as before at Detroit.

Effective June 1, the six operating divisions of the Cleveland, Cincinnati, Chicago & St. Louis were consolidated into three, known as the Ohio, Indiana and Illinois divisions. **J. E. Kissell,** division engineer of the Cleveland-Indianapolis division, has been appointed to the same position on the newly-created Ohio division, with headquarters as before at Bellefontaine, Ohio. **W. B. Hodge,** division engineer of the Chicago division, has been appointed division engineer of the new Indiana division, with headquarters as before at Indianapolis, Ind., and **E. H. McGovern,** division engineer of the St. Louis-Terre Haute division, has been appointed to the same position on the Illinois division, with headquarters as before at Mattoon, Ill. **L. B. Elliott,** division engineer of the Cincinnati-Sandusky division, with headquarters at Springfield, Ohio, has been appointed assistant division engineer of the Ohio division, with headquarters at Bellefontaine. **C. W. Engle,** division engineer of the Northern-Springfield division, with headquarters at Van Wert, Ohio, has been appointed assistant division engineer of the Indiana division, with headquarters at Indianapolis, Ind., and **E. J. Bayer,** division engineer of the Cairo division, with headquarters at Danville, Ill., has been appointed assistant division engineer of the Illinois division, with headquarters at Mattoon, Ill.

Edward Wise, Jr., special engineer on the Louisville & Nashville, has been appointed to the newly-created position of division engineer on the Pensacola division, with headquarters at Pensacola, Fla. Mr. Wise, who is 39 years old, was educated at the Kentucky State University and entered railway service in January, 1913, as a rodman on the L. & N. at Lexington, Ky. He was promoted to assistant resident engineer in January of the following year and continued in that capacity until January, 1916, when he became a topographer on preliminary and location surveys, later serving as assistant resident engineer on the construction of the Decoursey (Ky.) yard. During 1917 Mr. Wise left railway service for a few months, returning to the L. & N. on August 27 of that year as a draftsman. He was promoted to assistant engineer on the Knoxville division on January 24, 1919, and later in the same year was transferred to the chief engineer's office at Louisville, where he was promoted to special engineer on May 1, 1928. During the construction of a track elevation project at Birmingham, Ala., which was recently completed, Mr. Wise served as the representative of the L. & N. on an engineering committee which had charge of the project.

Edward Wise, Jr.

Track

W. R. Groshell, roadmaster on the Valley division of the Atchison Topeka & Santa Fe, with headquarters at Richmond, Cal., retired on May 31.

M. E. Batts, roadmaster on the Louisville & Nashville, with headquarters at Pensacola, Fla., retired on June 1, and the position of roadmaster at Pensacola has been abolished.

W. B. Hall, roadmaster on the Canadian Pacific, with headquarters at Renfrew, Ont., has been transferred to Otta-

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VERONA, PA.

"Since 1873"

wa, Ont., to succeed **F. Belkia,** who has retired. **H. Gunning,** roadmaster at Smith's Falls, Ont., has had his jurisdiction extended to include the territory formerly held by Mr. Hall.

C. A. Wester has been appointed roadmaster on the Portland district of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Ore., to succeed **C. A. Smith,** acting roadmaster.

M. M. Churchill, roadmaster on the Edson division of the Canadian National, with headquarters at Edson, Alta., has had his jurisdiction extended to include the territory formerly under the supervision of **W. Lucas,** roadmaster at Coalspur, Alta., who has been assigned to other duties.

T. P. Warren, a track inspector on the Chicago, Rock Island & Pacific, and formerly office engineer, with headquarters at Kansas City, Mo., has been appointed roadmaster on the Iowa-Minnesota division with headquarters at Des Moines, Iowa, to succeed **J. E. O'Brien,** whose death is noted elsewhere in these columns.

H. Maynor, formerly a supervisor on the Illinois Central, has been reappointed to that position at Newton, Miss., to succeed **L. E. Whatley,** who has retired. **F. T. Kraft,** who was also formerly a supervisor on the Illinois Central, has been appointed supervisor on the Iowa division, with headquarters at Cherokee, Iowa, to succeed **R. B. Johnson.**

In connection with a reorganization of the Monongahela in which the parent companies, the New York Central, the Pennsylvania and the Baltimore & Ohio, have taken over the actual operation of the property, **D. K. Orr,** formerly superintendent, with headquarters at Brownsville, Pa., has been appointed roadmaster, with the same headquarters.

Effective June 15, track supervisors districts of the Minneapolis & St. Louis were consolidated to form six districts instead of nine as heretofore. **C. S. Weatherill,** bridge and building supervisor, with headquarters at Fort Dodge, Iowa, has been appointed supervisor of track, with headquarters at Oskaloosa, Iowa, to succeed **R. F. Lechner.** The remaining track supervisors with their headquarters are as follows: **J. W. Zettelmier,** Monmouth, Ill.; **George Teyro,** Hopkins, Minn.; **John Factor,** Watertown, S. D.; **F. B. Clark,** Fort Dodge, Iowa; and **J. W. Hruska,** also Fort Dodge.

Bridge and Building

J. C. Bardin has been appointed superintendent of scales of the Texas & Pacific and its subsidiary lines, with headquarters at Dallas, Tex., succeeding **T. O. Dean,** whose death was noted in the June issue.

C. F. O'Conner, superintendent of construction on the Western Region of the Canadian National, with headquarters at Edmonton, Alta., has been appointed bridge and building master of the Kamloops division, with headquarters at Kamloops, B. C., to succeed **J. A. Crawford,** who has been transferred to Saskatoon, Sask. The position of superintendent of construction has been abolished.

F. B. Helwig, master carpenter of the Arkansas-Louisiana division of the Chicago, Rock Island & Pacific, with headquarters at Little Rock, Ark., has been transferred to the Oklahoma division, with headquarters at El Reno, Okla., to succeed **A. H. Sturdevant,** whose appointment as roadmaster at El Reno was noted in the June issue. The position of master carpenter at Little Rock has been abolished.

Following a consolidation of divisions on the Minneapolis & St. Louis, the territories of **S. J. Johnson,** bridge and building supervisor at Oskaloosa, Iowa, and **E. R. Reed,** bridge and building supervisor at Minneapolis, Minn., have been extended to include the territory of **C. S. Weatherill,** bridge and building inspector at Fort Dodge, Iowa. As noted elsewhere in these columns Mr. Weatherill has been appointed supervisor of track, with headquarters at Oskaloosa, Iowa.

Obituary

A. C. Holley, tie and lumber agent of the Delaware & Hudson, with headquarters at Albany, N. Y., died on May 7.

R. B. Abbott, assistant general superintendent on the Reading, at Reading, Pa., and formerly a division engineer on this road, died at his home at Reading on June 25.

J. E. O'Brien, roadmaster on the Iowa-Minnesota division of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Iowa, died on May 30.

David Sloan, formerly chief engineer of the Illinois Central, died on June 25, at Wilmette, Ill., a suburb of Chicago, at the age of 85 years. Mr. Sloan was born on July 4, 1847, at Belfast, Ireland, and entered railway service in 1871 as a chainman on construction with the Lake Shore & Michigan Southern (now part of the New York Central). In 1874 he went with the Eastern Kentucky (now the Eastern Kentucky Southern) as chief engineer at Grayson, Ky. After three years with this company he returned to the L. S. & M. S. on harbor work at Ashtabula, Ohio. From 1883 to 1887, he was with the Chicago & Atlantic (now part of the Erie), serving as chief engineer during the last two years of this period. In the latter year, Mr. Sloan went with the Chicago, Milwaukee & St. Paul, as an assistant engineer, soon leaving this road to become assistant chief engineer of the Illinois Central. On August 1, 1897, he was advanced to acting chief engineer and in January, 1898, he was appointed chief engineer, a position he held until 1901, when he was appointed chief engineer on construction of the Illinois Central. In 1902 Mr. Sloan left railway service to become chief engineer with the MacArthur Brothers Company, general contractors at Chicago, later serving this company as consulting engineer.

Supply Trade News

General

The Johns-Manville Sales Corporation has moved its general office from 292 Madison avenue, to 22 East Fortieth street, New York City.

Personal

Joseph J. Tynan, who retired in July, 1932, as vice-president of the Bethlehem Steel Company, with headquarters at San Francisco, Cal., died of heart disease on June 6, at his home in that city.

J. W. Montigney, who has served with the **Cleveland Tractor Company,** Cleveland, Ohio, for more than 16 years in charge of its transportation division, has been placed in charge of railway sales of Cletrac crawler tractors. Mr. Montigney was born on September 29, 1893, and entered railway service on February 12, 1912, in a local freight office of the New York, Chicago & St. Louis, being transferred to the general freight department in May, 1917. On November 1 of the same year, Mr. Montigney left railway service to go with the Cleveland Tractor Company as traffic manager and has served this company continuously since that time. Mr. Montigney has also served as chairman of the Great Lakes Regional Advisory Board and the National Industrial Traffic League.

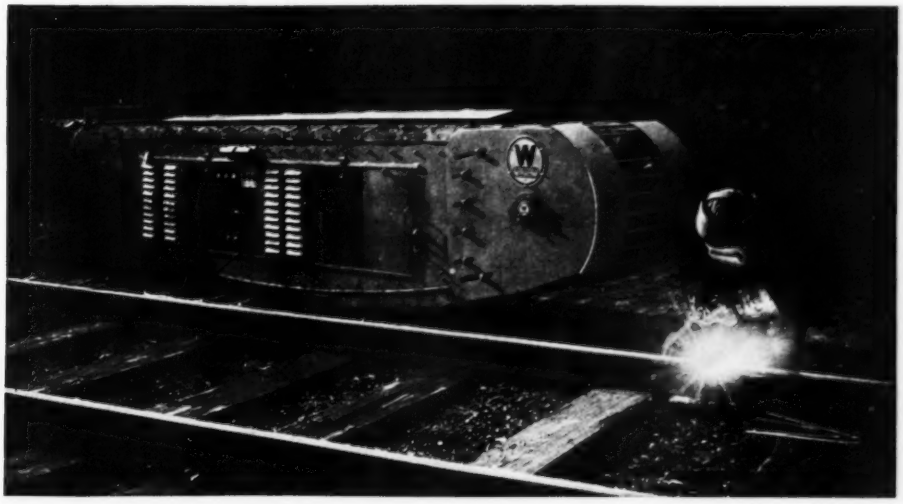
J. W. Montigney

Trade Publications

Concrete Floors.—The Portland Cement Association, Chicago, has issued two four-page folders entitled, "Concrete Floors for Industrial Buildings" and "Concrete Floors—How to Build Them." The former discusses various methods of obtaining durable concrete floors, while the latter discusses cost, safety, smoothness, solidity, comfort and maintenance. Working specifications for bonded concrete floor finishes have also been published by the association.

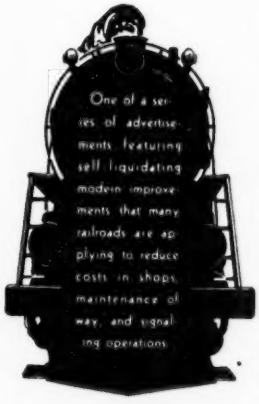
● RAILROAD-DEVELOPED

● WESTINGHOUSE-BUILT



New Westinghouse Tractor Welder for maintenance of way work—furnishes power for Welding, for operating electric tools and for lights.

This TRACTOR WELDER *saves your maintenance Dollars*


One of a series of advertisements featuring self liquidating modern improvements that many railroads are applying to reduce costs in shops, maintenance of way, and signaling operations

FOR the first time! A tractor-mounted power and welding unit designed especially for track, bridge, and structure maintenance.

This new machine furnishes ample power for simultaneous welding and operation of electric tools such as grinders, slotters, drills and nut tighteners.

Long, expensive welding cables are unnecessary. Its small size permits operation along the track shoulder clear of traffic. It can pivot, cross tracks, climb steep slopes and reach positions inaccessible to other types of equipment.

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Westinghouse is prepared to furnish portable or stationary welding and power units with *any* type of mounting desired.

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A Complete Consulting *and* Water Treating Service

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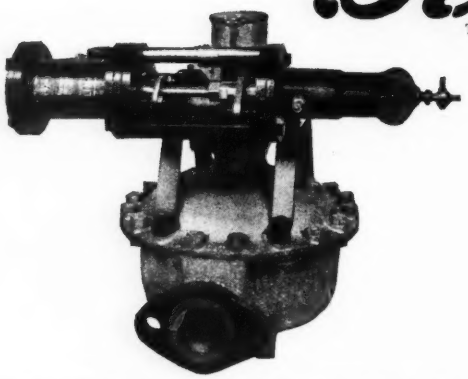

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Write us for printed matter illustrating and describing a new invention for fumigating all kinds of railroad cars, including loaded and empty freight cars.

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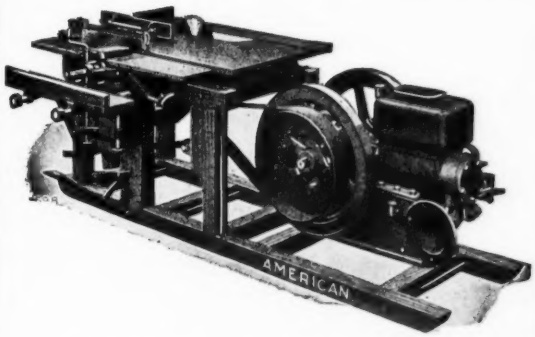

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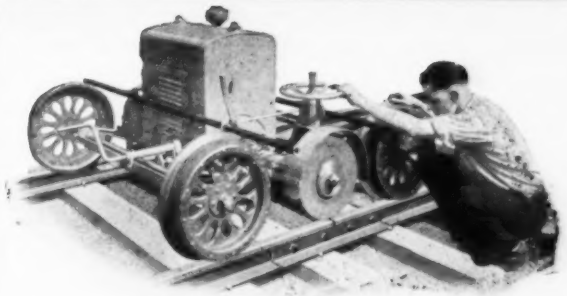

Railway Track-work Company Portable Track Grinder, Model P-4
Operated by 12 h.p., 4 cyl. gasoline engine, 1500 r.p.m. Ingenious hand crank starter makes it impossible to injure operator. Weight complete, 1200 lbs. In all other respects similar to Model P-2 Grinder.

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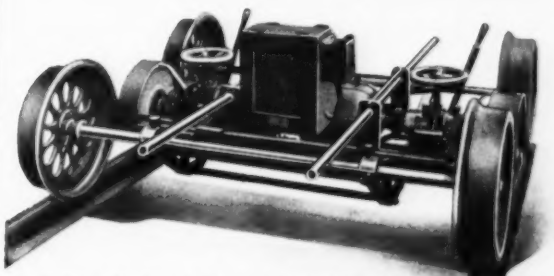

Railway Track-work Company Portable Track Grinder, Model P-2
Two grinding heads, operating independently, one on each rail. Electric motor driven. Grinding wheel operates at 900 surface ft. per min., feed regulated by hand wheel. Grinds gauge line or outside of rail. Derailing rollers raise grinder clear of track. P-4 same as above except operated by gasoline engine.

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Fairbanks-Morse "Sheffield" No. 46 Motor Car equipped with 2 Timken Bearings on the engine crank shaft and 8 on the axles —vital points.

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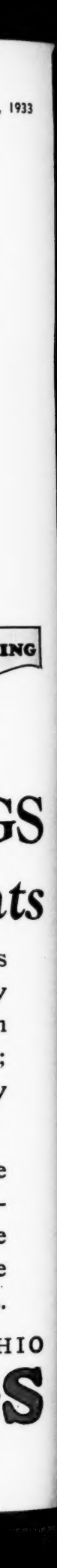
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